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American Machinist

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Small Hole Grinding With Diamond-Charged Wheels

•

Press Extrudes Nickel-Alloy Tubing

•

Electric Signal Boards Coordinate Crane Operations

•

Interchangeable Assembly Units Coordinated by Master Tooling

Sub-Zero Treatment of Steel

If you have a receptive mind . . .

and an interest in your company's post war plans . . . we believe you will want to know the story of Heald Precisioneering. Basically, it is an opportunity to improve the quality of your products . . . and to lower their costs. Specifically, it means that when work is finished on a Heald Machine, you can expect *greater* precision and *increased* production rates. We have countless case histories to back this up. Many of them are probably in your own industry. We would like to present them to you at your convenience . . . whether your work is small and simple or large and intricate like the part shown above. For *More Precision Faster* — get in touch with Heald today.

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Internal and Surface Grinding Machines • Bore-Matic Precision Finishing Machines

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American Machinist Chips

Machinery Ho . . . Goodness knows what may have happened between the time this is being written and the date of issue, but the Department of Commerce tells us that the WPB's Schedule B for the 1944-45 farm implement production program has been slightly increased over the former schedule. The obstacles which may obstruct completion of the program are manpower shortages and the tightness of supply of malleable castings.

In electrical machinery, it is felt that 1945 will be devoted to re-assembling and promoting development plans which were shelved by the urgency of war production.

The Surplus Property Board will handle the disposal of all electrical commodities declared surplus by the various agencies. Of $10,000,000,000 of radio transmitting apparatus and related products, probably only $1,000,000,000 worth would be salvagable. At least half of this would consist of repair parts useful to manufacturers and servicemen. There is, however, no visible supply of surplus electric motors. Possibly 10,000,000 h.p. produced in excess of normal will be, for the most part, built into various types of equipment such as machine tools and the like, and offered for sale as integral parts of these items.

Red-Face Department . . . Back in the January 4 issue, this column quoted a story from the Glenn L. Martin magazine relative to the long and honorable life of the famous China Clipper. Just one week later, if you recall, the Clipper crashed.

This made us feel something like a bad luck omen, and we weren't surprised when a reader sent us in a clipping of our story pasted to the newspaper account of the tragedy. No comments were made (or needed). Anyway, thanks, correspondent, for not rubbing it in.

Cash for Practical Ideas . . . One of *American Machinist's* best known and best liked departments, according to our continuing study of what you men want in this publication, is "Practical Ideas." Coming straight from the field, these helpful short-cuts and ingenious production tips represent the cream of ideas received from practical men in Metal-Working plants all over the country.

So that this feature may be ever improved, we'd like to remind you that we are always anxious to have you send in your own ideas. If our editors can use your story, you won't have to wait for its publication but *will be paid promptly upon acceptance.* Your story should be factual and condensed as much as possible. No elaborate drawings are needed—just send in a rough sketch or a photograph. We'll doll it up. This is a good way not only to pick up a few extra dollars, but to make a definite contribution to our present all-out production effort. Send your suggestions to Practical Ideas Editor, *American Machinist,* 330 West 42d St., New York 18, N. Y. The more the merrier.

Coincidence . . . The Bureau of Census has made what is apparently a very exhaustive study of the effect of the war on marriages and resultant products. Strangely enough, it is found that the increase in marriages during the war has been followed by a boom in babies. In case any of you are interested, the marriage business reached a peak in 1942, is now on a very definite downgrade and may be expected to shoot up to normal after 1956. All of which is slightly out of our line, but, shall we say, "basic."

D'ya remember, Joe, when the two of us started in with that little old machine shop way back there in 1942?"

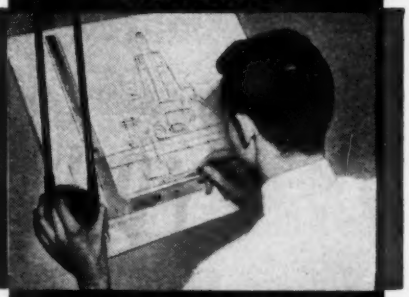
COLLIER'S — SGT. FRANK BRANDT

Courtesy of Collier's and Sgt. Frank Brandt

to help you

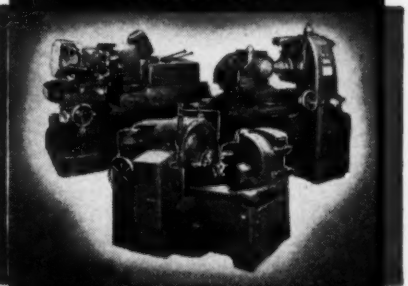
1 SOLVE BEVEL GEAR DESIGN PROBLEMS

BEVEL GEAR DESIGN ENGINEERING



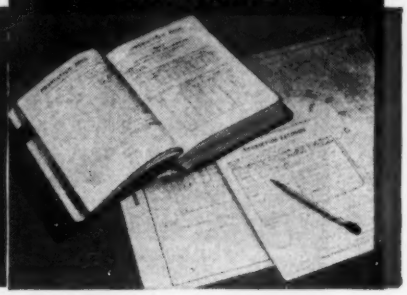
2 OBTAIN THE RIGHT EQUIPMENT FOR YOUR NEEDS

BEVEL GEAR EQUIPMENT ENGINEERING



3 ESTIMATE YOUR PRODUCTION TIME AND COSTS

BEVEL GEAR PRODUCTION ENGINEERING



the COMPLETE Gleason Engineering Service . . .

. . . when you have a problem involving bevel gear design or production, the solution can be secured from the Gleason Works—without obligation. Highly skilled engineers, backed by the company's *80 years' experience* in designing bevel gears and building bevel gear machinery, will study your bevel gear drive designs. Profitable improvements are often suggested. Correct gear cutting machines, tools and auxiliary equipment to meet your specific manufacturing requirements will be recommended. Further, we'll prepare for you estimates of production time, based upon actual shop practice. By utilizing this complete service you can save time and money.

WHAT WE NEED to help you

FOR PRODUCTION ENGINEERING

1. Blueprints of your bevel gear designs.
2. Material specifications and manufacturing tolerances.
3. Quantity of gears to be produced per month.
4. Number of working hours per month available for gear production.

FOR DESIGN ENGINEERING

1. Preliminary layouts or prints of proposed bevel gear drive designs.
2. Type of drive.
3. Horsepower and speed required.
4. Type of loading (constant, intermittent or shock).
5. Driving member and direction of rotation.

For informative literature on the design, manufacture and application of straight, spiral and Zerol bevel and hypoid gears, write on your firm's letterhead.

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GLEASON WORKS

Builders of Bevel Gear Machinery for Eighty Years

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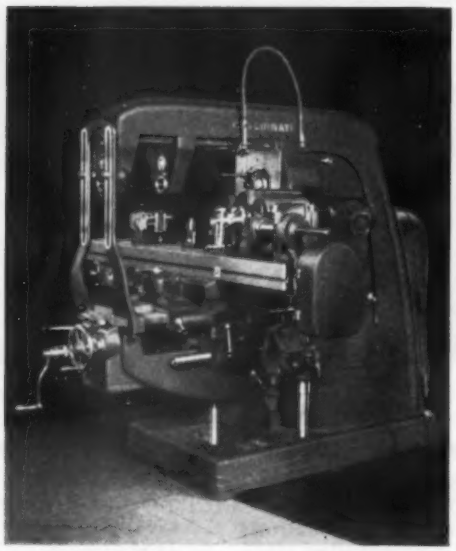
CINCINNATI

YOU GET A 3 TO 1

with this equipment

ON A DIAL TYPE MILLER



CINCINNATI *No. 3 Plain High Speed Dial Type Milling Machine. Available in Plain, Universal and Vertical styles, Nos. 2, 3 and 4 sizes, in Medium and High-Speed Ranges. Catalog M-970-2 contains complete specifications. For a brief description look in Sweet's Catalog File.*

With conventional universal equipment, a knee-and-column type miller could mill but one helical fluted reamer at a time. That was too slow for a manufacturer of tools, so Cincinnati Engineers equipped a No. 2 Universal Dial Type Miller with a *three-spindle* dividing head to handle *three parts at one time.* ¶ You will notice that the machine has a sub-plate on the table to change the position of T-slots to fit the spacing of a special three-spindle dividing head. Special equipment also includes individual tailstocks and standard enclosed driving mechanism, slightly tailored to fit the special head. This setup, developed by Cincinnati Application Engineers, demonstrates the advisability of discussing *your* milling problems with this group of authorities. They will be glad to give you the benefit of many years' experience.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

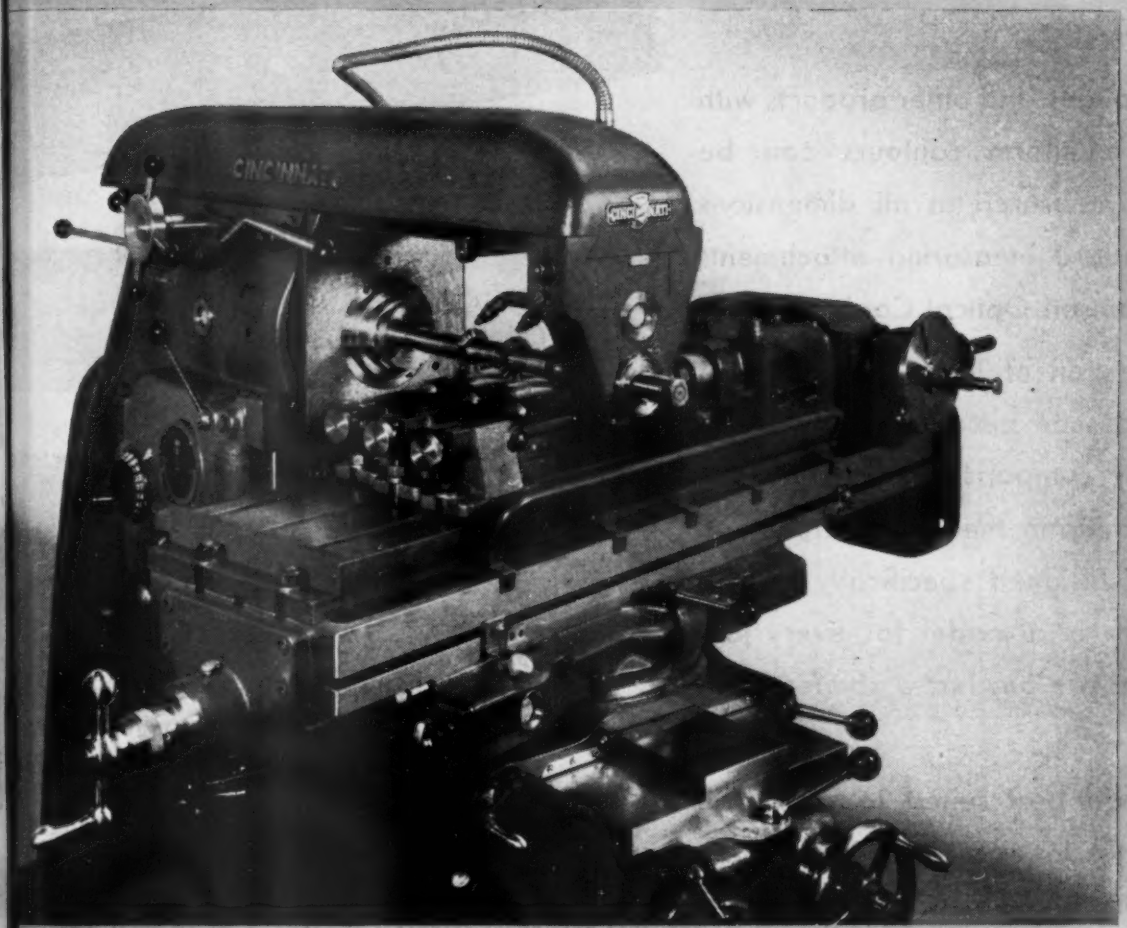
Keep on buying
WAR BONDS

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

THE CINCINNATI

MILLING MACHINES

ADVANTAGE . . .



Milling helical flutes in three straight reamers at one time. The machine is a CINCINNATI No. 2 Universal Dial Type Miller with special Three-Spindle Dividing Head.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

This, in brief, is what a manufacturer of precision tools and gauges has to say about *his* Jones & Lamson Optical Comparator. The record speaks for itself, but it is just one of hundreds of instances where the use of these Comparators has resulted in inspection economies, better products and satisfied customers.

Form tools, gauges and other products with complex or multiform contours can be checked and measured in all dimensions with the standard measuring attachments of Jones & Lamson Optical Comparators.

Or, the inspection of large quantities of duplicate parts can be made rapidly and accurately, by comparison with a master outline drawn upon the glass screen, on Comparators designed specifically for this purpose. There is a model for every job, and the results are *beyond a shadow of a doubt.*

For the method best suited to your own needs, consult a Jones & Lamson inspection engineer. There is one near you, and he is backed by an organization with over 20 years experience in the optical inspection field.

"INSPECTS 200% FASTER THAN FORMER METHODS"

"NO CUSTOMER REJECTIONS SINCE INSTALLED"

"CHECKS ACCURATELY IN ALL POSITIONS"

"CHECKS .0002" TOLERANCES ON CONTOUR GAGES"

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.

2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*

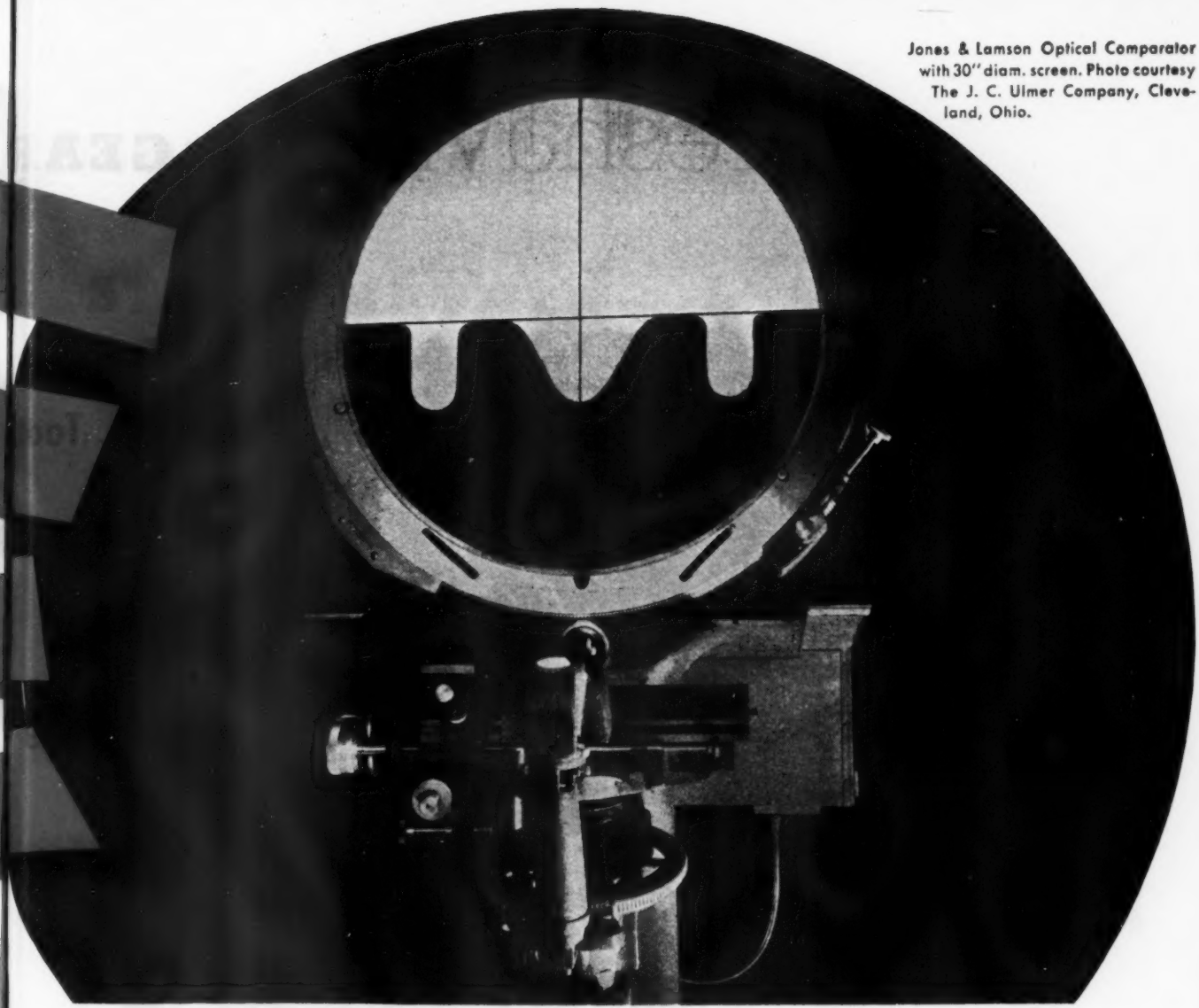
3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.

4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.

5. Rigid Machine Construction.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

DID YOU KNOW...
THAT JONES & LAMSON OPTICAL COMPARATORS ARE USED TO INSPECT PRECISION-MADE COMPONENTS OF THE DRY SHAVERS THAT REMOVE YOUR WHISKERS SO SMOOTHLY AND RAPIDLY.



Jones & Lamson Optical Comparator with 30" diam. screen. Photo courtesy The J. C. Ulmer Company, Cleveland, Ohio.

JONES & LAMSON

MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

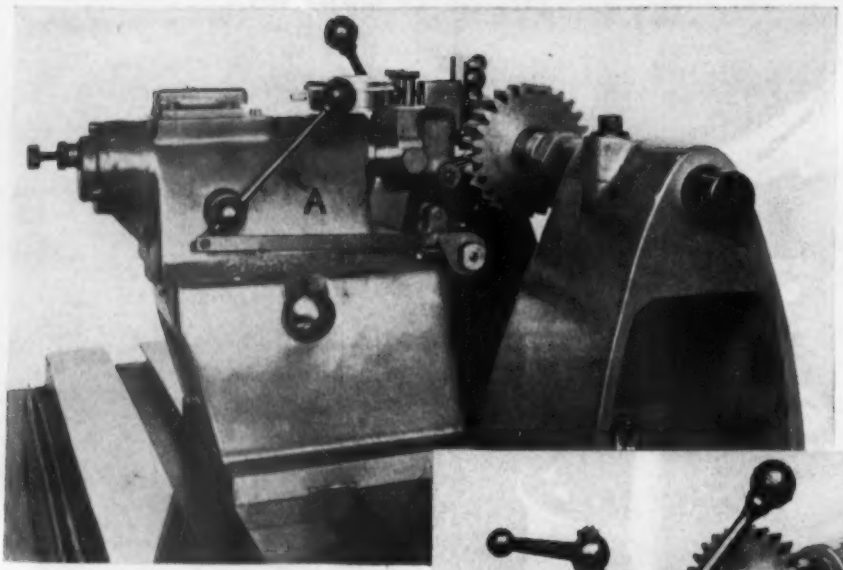
Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

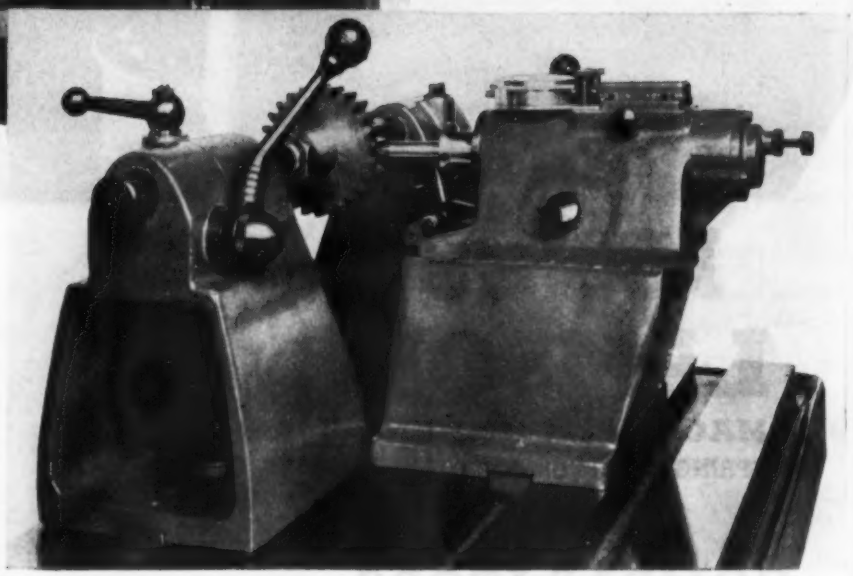
BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS
STANDARD BENCH COMPARATOR
BENCH COMPARATOR 14" DIAM. SCREEN
DIRECT PROJECTION COMPARATOR
STANDARD PEDESTAL COMPARATOR
PEDESTAL COMPARATOR 22"—30" DIAM. SCREENS

Preshaving

GEARI

★ **Improved-Type Fellows Cone, Tooth Spacing and Taper Inspection Instruments Facilitate Checking**





Above: No. 12C Inspection Instrument set up for checking tooth spacing. Lever automatically indexes the gear, tooth by tooth, when spindle is withdrawn.

At right: The same instrument with Cone Point in use.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

INSPECTION

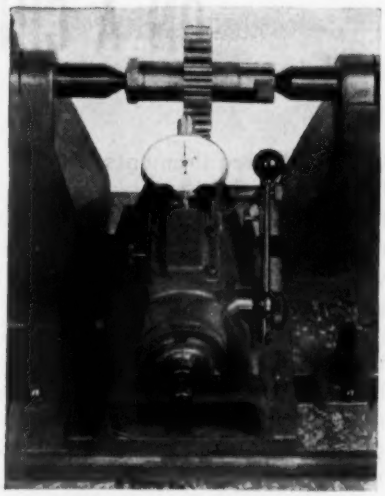
STILL FURTHER *simplified*

For ease of operation, and for speedy shift-over from one test to another, Fellows has incorporated in the new Nos. 12C and 12CT inspection instruments, illustrated here, quickly interchangeable cone points and tooth spacing checking units. The dial indicator which is graduated in tenths of a thousand, is used interchangeably with all three set-ups.

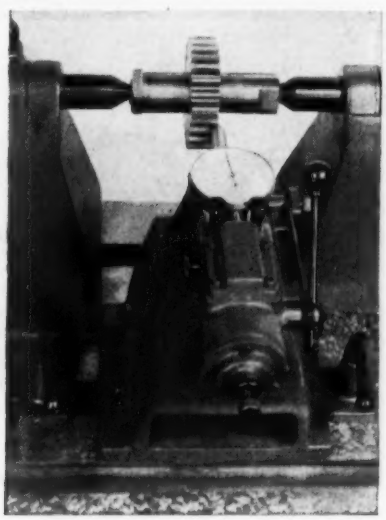
As shown in the illustrations on the opposite page, the spindle carrying the cone point or tooth spacing checking head, is operated by a lever A, and the return movement of this lever through the medium of an auxiliary mechanism, automatically indexes the gear. No. 12C is for cone and tooth spacing only, but No. 12CT is adapted to making all three checks: cone, tooth spacing and taper.

When checking taper on the No. 12CT instrument, the bracket carrying the cone pointer is moved along the bed by a hand wheel. Adjustable stops are provided for positioning the bracket, so that checks can be made at the same points in the face width of each gear.

For more details write for descriptive circular, to The Fellows Gear Shaper Company, Springfield, Vermont—or 640 West Town Office Bldg., Chicago 12, Ill. — or 616 Fisher Bldg., Detroit 2, Mich.



Above and below: No. 12CT Inspection Instrument showing Cone Point checking for taper of tooth.



Fellows

L OPERATIONS FROM BLANK TO FINISHED GEAR

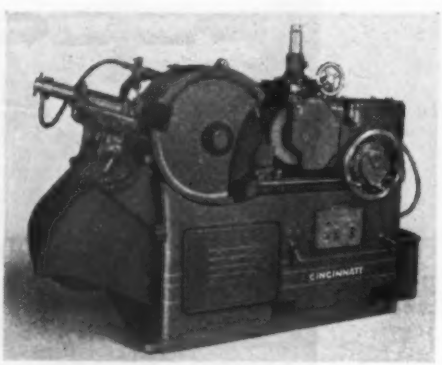
THREE REVOLUTIONS AND STOP ARRANGEMENT

facilitates this infeed job

ON A CINCINNATI NO. 3 CENTERLESS

One of the requirements on this job (grinding both ends of link tubes for tank tracks) was fast production, and to accomplish the desired rate a CINCINNATI No. 3 Centerless Grinder was equipped with profile hydraulic truing over grinding wheels; (two grinding wheels were used) five position truing control valve having truing and rapid advance rates in each direction; profile hydraulic truing over regulating wheel; special work rest; hand infeed arrangement known as "three revolutions and stop" to provide ample wheel opening for loading the work . . . a great convenience for the operator.

¶ Although profile hydraulic truing over the grinding wheel was not needed for this work, it was included in the setup because it's useful in shops handling a variety of work. The wide regulating wheel helps guide the work into position . . . a safety factor in loading. Profile truing equipment over the regulating wheel performs the function of truing a relief in the center of the wheel. ¶ Talk over your grinding problems with our engineers. Through the application of the centerless method, they may be able to give you faster, more economical production and greater accuracy.



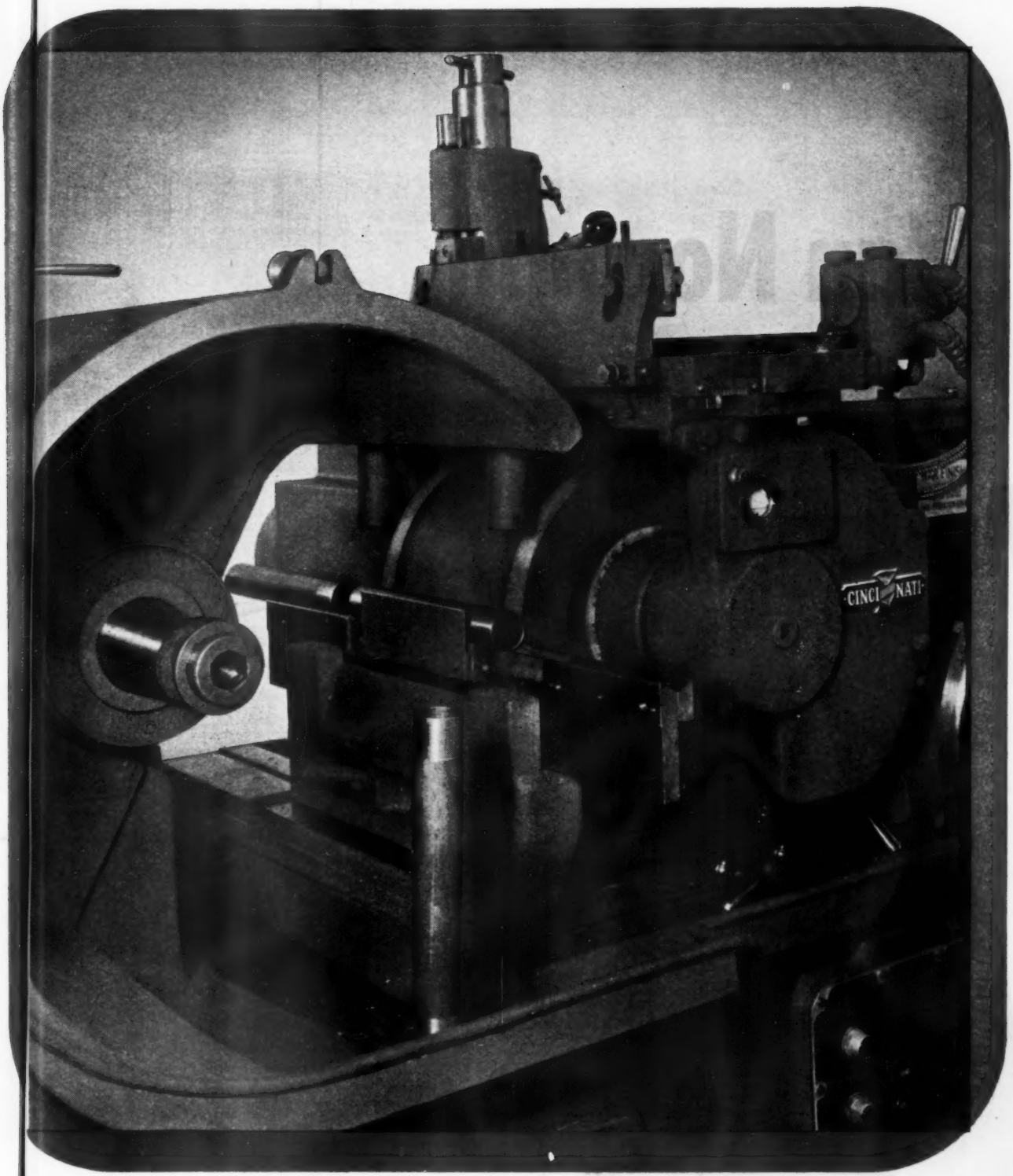
CINCINNATI *No. 3 Centerless Grinder. Catalog G-456-3 contains complete specifications. Sweet's Catalog File for Mechanical Industries gives a brief description.*

CINCINNATI

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES



CINCINNATI No. 3 Centerless Grinding Machine tooled up to grind simultaneously two widely spaced diameters. The grinding wheels have been removed to afford a clearer view of the work in grinding position. Profile hydraulic truing arrangement over grinding wheel not visible in this illustration.

GRINDERS INCORPORATED

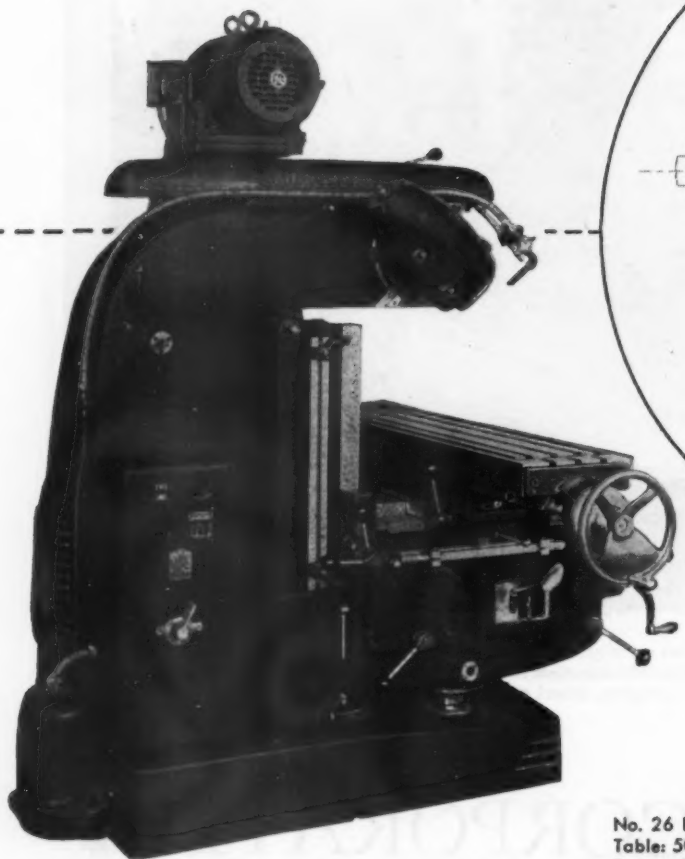
CINCINNATI 9, OHIO, U. S. A.

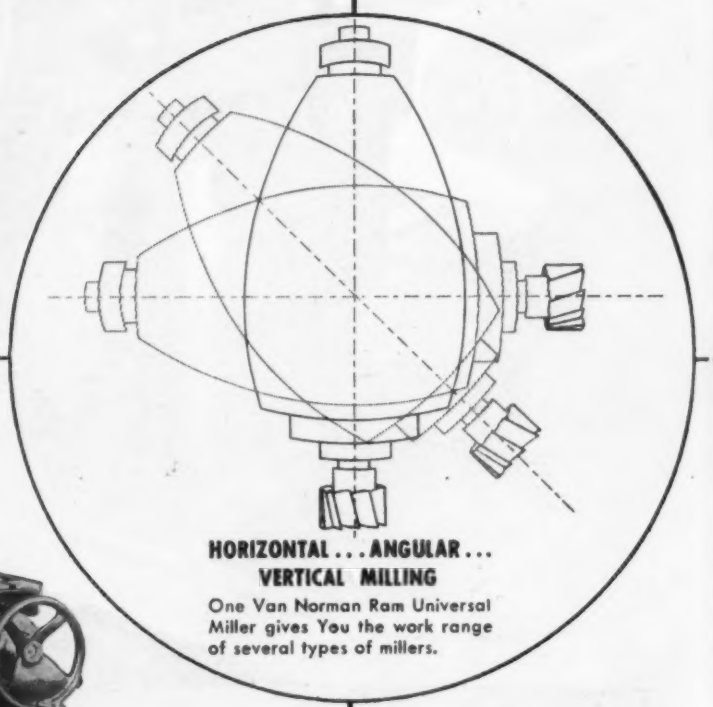
CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Van Norman

Ram Type Universal

Milling Machines





HORIZONTAL . . . ANGULAR . . . VERTICAL MILLING

One Van Norman Ram Universal Miller gives You the work range of several types of millers.

SPECIFICATIONS:

No. 26 Ram Type Universal Miller
Table: 50" x 12"
Range: 28" longitudinal, 12" across, 18" vertical
18 Speeds: 30 to 1500 r.p.m.
18 Feeds: ⅜" to 32"

Vertical Milling—In the illustration at right, the operator is vertical milling a recess in the workpiece.

Angular Milling—Here, the operator is milling a "V" in the workpiece. Note that the set-up of the work is in the original position.

Horizontal Milling—The operator is completing the job with a face milling operation. One work set-up and simple changes of the versatile cutterhead and sliding ram enables the operator to carry most jobs through to completion on a Van Norman Ram Type Universal Miller.

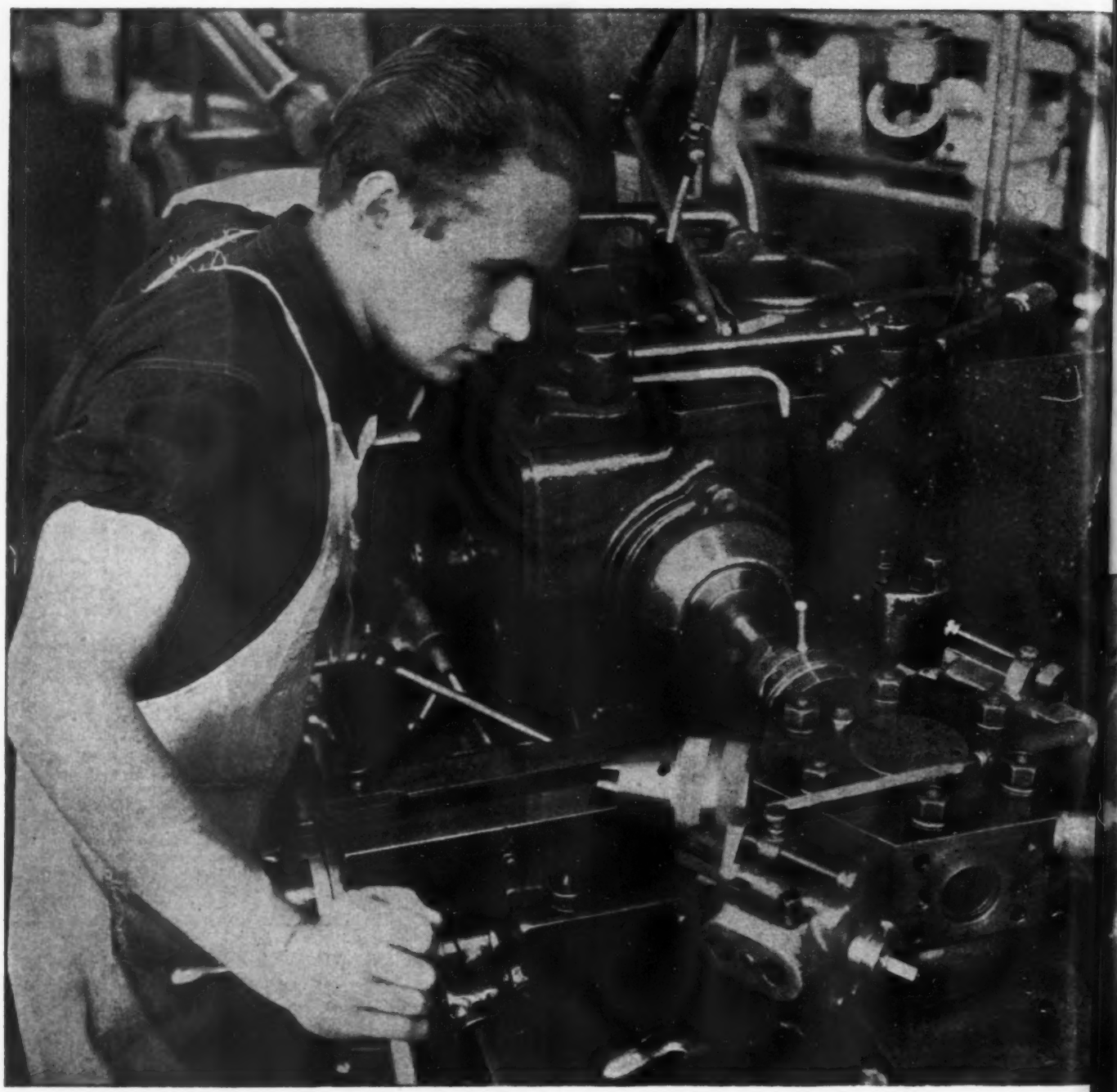
Van Norman Ram Type Universal Milling Machines materially reduce time-wasting reset-ups and cut idle time by as much as 50%.

Here's how.—By simply changing the position of the adjustable cutterhead from horizontal to angular or vertical position . . . you can perform most milling operations on a particular workpiece without a single change of the original set-up. Not only does the adjustable cutterhead enable the operator to complete a job in a shorter time, but because the workpiece stays "put", errors that often accompany work reset-ups are eliminated.

In addition, such Van Norman advantages as directional front and rear controls of all power feeds, large, easy-to-read dials, the extreme ruggedness of the column, ram, saddle and knee assemblies . . . all assure accuracy, economy and maximum production.

THE VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

"It pays to Van Normanize"



The few operating parts of LANDIS Die Heads and their precise assembly make it possible to produce threads within extremely close tolerances on a high production basis.

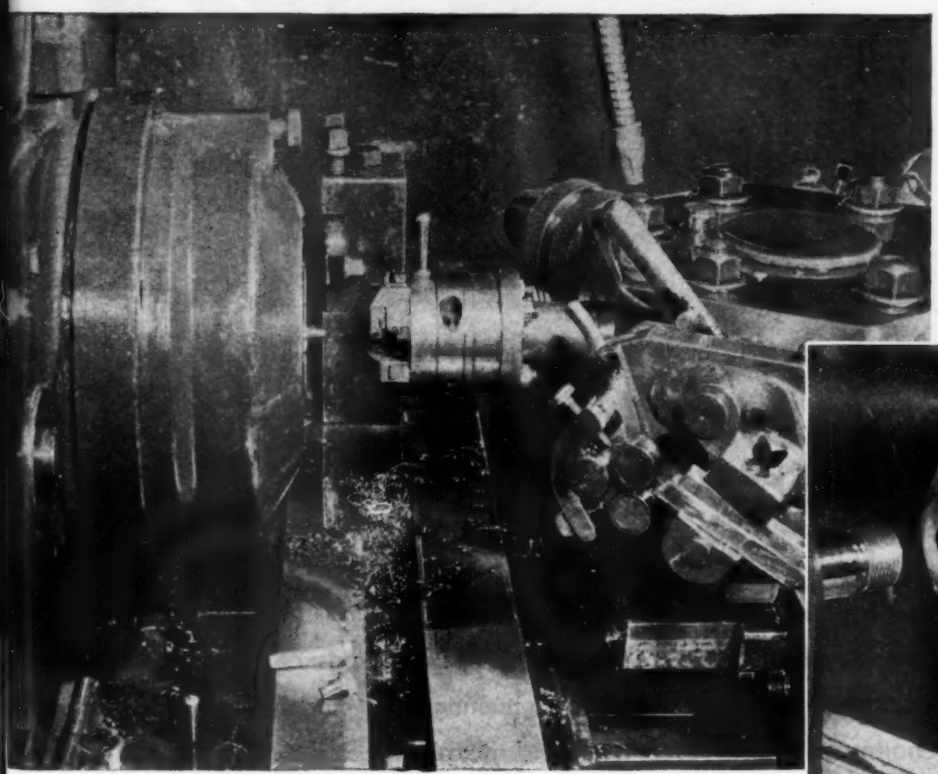
Send for Bulletins describing Landmatic Die Heads

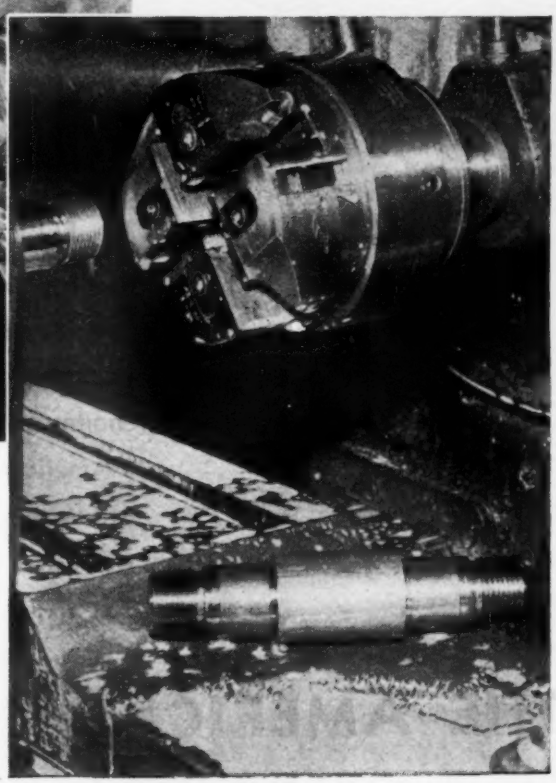
LANDIS MACHINE CO.

THREADING MACHINES · COLLAPSIBLE TAPS · PIPE THREADING MACHINERY

LANDMATIC

Hardened and Ground or Heat Treated DIE HEADS Are Used in Turret Lathe Operations in Most Aircraft Plants





WAYNESBORO PENNA·U·S·A·

DIE HEADS · CHASERS

THE PAYROLL DOLLAR buys more

THE PAYROLL DOLLAR *buys more*

...WHEN "AMERICAN" MULTI-PRODUCTION LATHES ARE USED

HERE, for example, is an "American" in one of our most prominent shops actually producing four (4) times more work than the fairly modern machine it replaced. In hundreds of plants "American" Multi-Production Lathes are lightening the burden of higher wages, shorter hours, increased taxes and inexperienced operators. That is why "Americans" are the choice of cost-minded production men. The many productive features responsible for such results are clearly illustrated and described by our new bulletin No. 445.

THE AMERICAN TOOL WORKS COMPANY

LATHES • RADIALS • SHAPERS

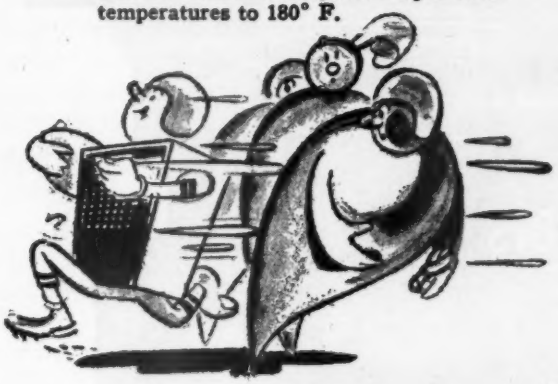
CINCINNATI, OHIO, U. S. A.

HERE'S ALLIS-CHALMERS' GREAT NEW V-Belt Team!

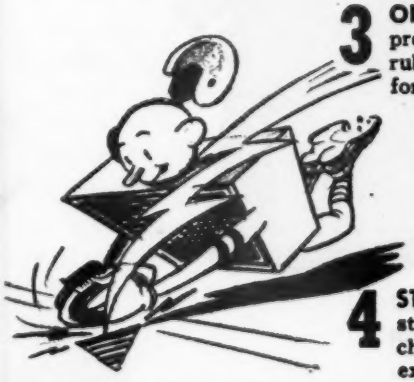
ALLIS-CHALMERS recommendations for belt selections are unbiased . . . because Texrope's V-belt lineup is *complete.* And as inventor of the multiple V-belt drive, A-C offers sound engineering help . . . backed by the world's longest experience in giving industry money-saving drives.

1 **HEAT-RESISTING SUPER-7** has ability to withstand high ambient built right into it. Standard belt, it can operate in temperatures to 180° F.

2 **OIL-RESISTING SUPER-7** is right for drives where fairly bad oil conditions prevail. Neoprene-covered, it resists oil spray and grease.



3 **OIL-PROOF SUPER-7,** is solid Neoprene—a synthetic unaffected by most rubber attacking liquids. Recommended for *extreme* oil conditions.



4 **STATIC-RESISTING SUPER-7** *conducts* static charge to machine for grounding charge. This safety belt is applied where explosion danger exists.

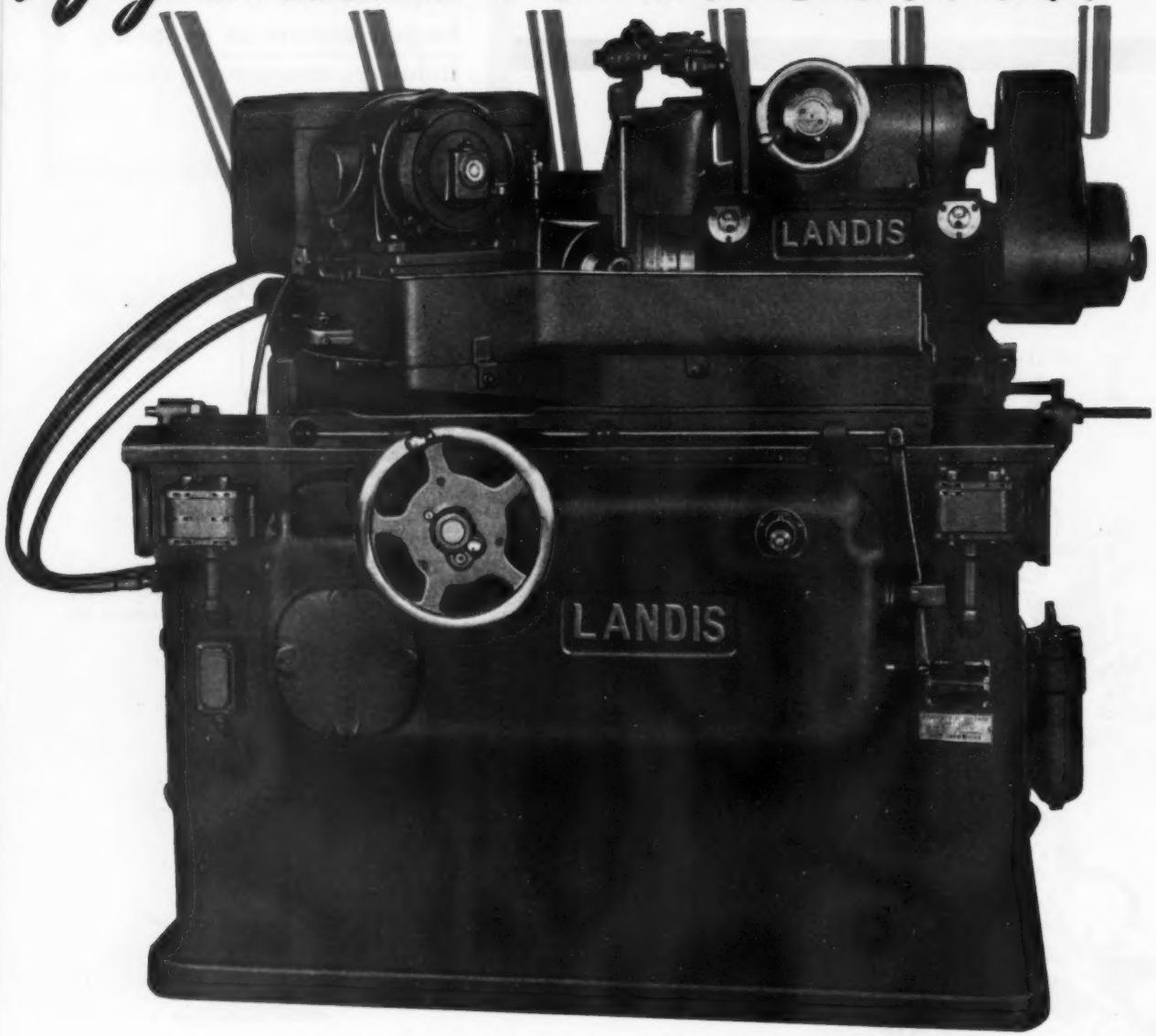
5 **SUPER-7-STEEL** employs endless steel cables to provide greater strength, reduce belt stretch. It is ideal for driving extra-heavy loads.

A 1732

IT PAYS TO MAKE ALLIS-CHALMERS YOUR V-BELT DRIVE HEADQUARTERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

If you want PRODUCTION



LANDIS 6" TYPE-C HYDRAULIC VALVE FACE GRINDER
*** Semi-automatic * High production * Precision output**

LANDIS TOOL
Precision Grinders

LANDIS TOOL CO. • •

plus PRECISION in Grinding Valves—

Look to the Established Leader in the manufacture of Valve Grinders

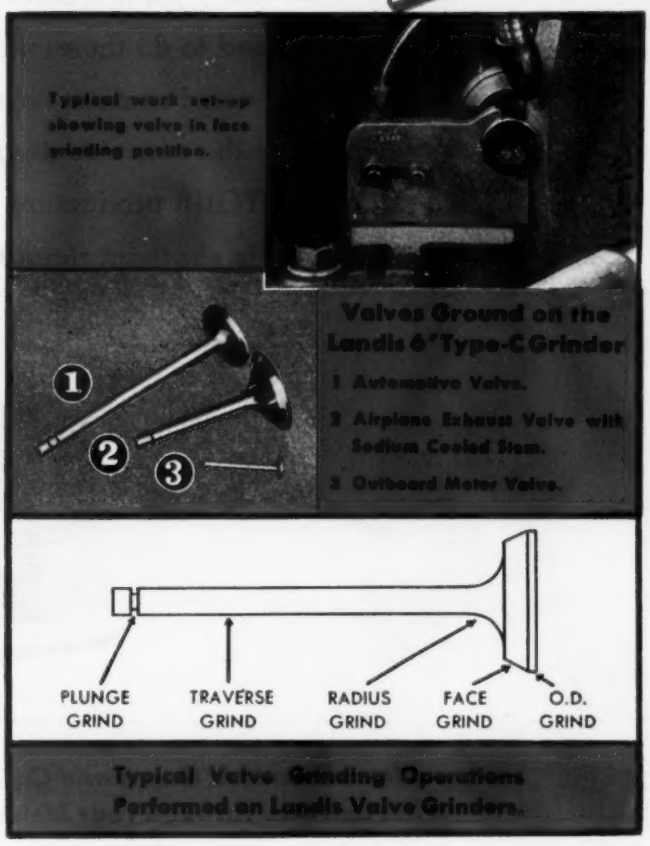
When highly developed airplane valves with extremely close tolerances were demanded in great volume, the aircraft industry turned to Landis Tool as the leading producer of valve grinders for the automotive industry over many years.

For the operations involved, face grinding in particular, the Landis 6" Type-C Hydraulic Valve Face Grinder was found to be most effective in producing desired results. It is semi-automatic; so simplified as to require only manual loading and unloading, and manipulation of a single control.

Production speeds of 300 to 600 per hour are possible depending on the tolerance required and the diameter of the valve head. Concentricity of the valve face with the stem can be maintained within a limit of .0005"while the micrometer feed dial allows feed settings as close as .0001" in terms of work diameter.

Take advantage of the valve grinding experience of the largest manufacturer of grinders for valves. Get in touch with Landis Tool engineers for help on valve grinding problems, or write for Catalog G43.

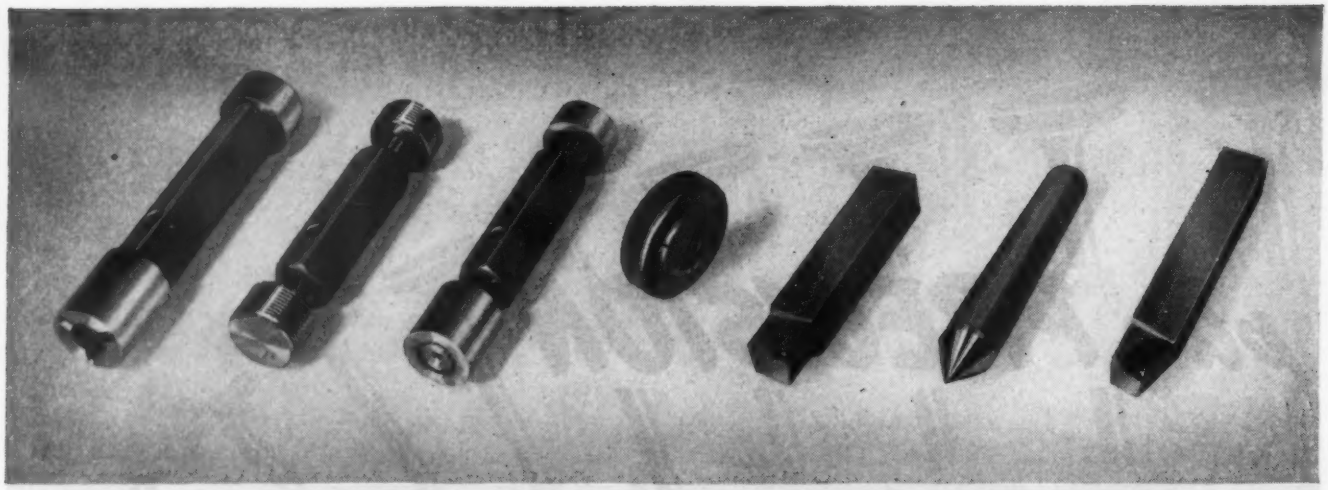
13



"Better Grinding" explains the basic principles of precision grinding. Invaluable for both the operator and the man responsible for grinding. Write for your copy today.

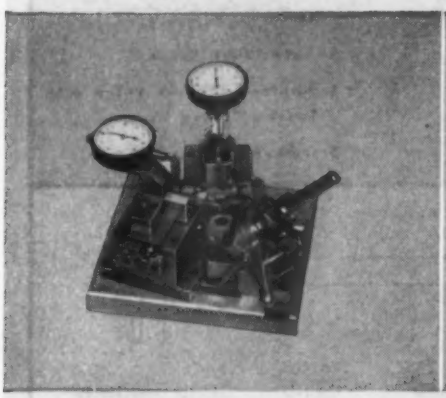
LANDIS TOOL Company

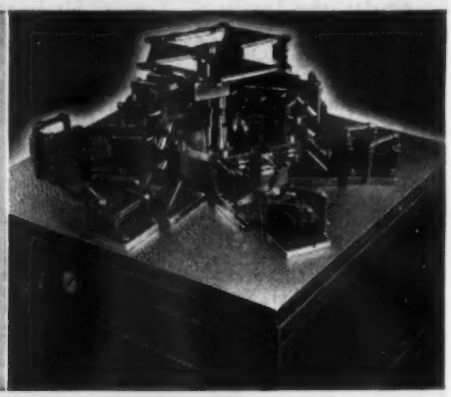
WAYNESBORO, PA.



METRO'S experience is yours

Metro engineers and craftsmen know their tools and gages because they have for many years studied your requirements . . . studied jobs and the tools required to do them. Metro experience and "know-how", whether embodied in stock items or specially designed gages and tools for special needs, meet the most exacting requirements for precision and accuracy in YOUR production. Metro engineers will help you design special tools and gages to short-cut those tricky, troublesome jobs.





ARMY (E) NAVY

Metro Standard Gages and Carbide Tipped Tools are available for immediate delivery through your Metro distributor. Write today for Metro Catalog.

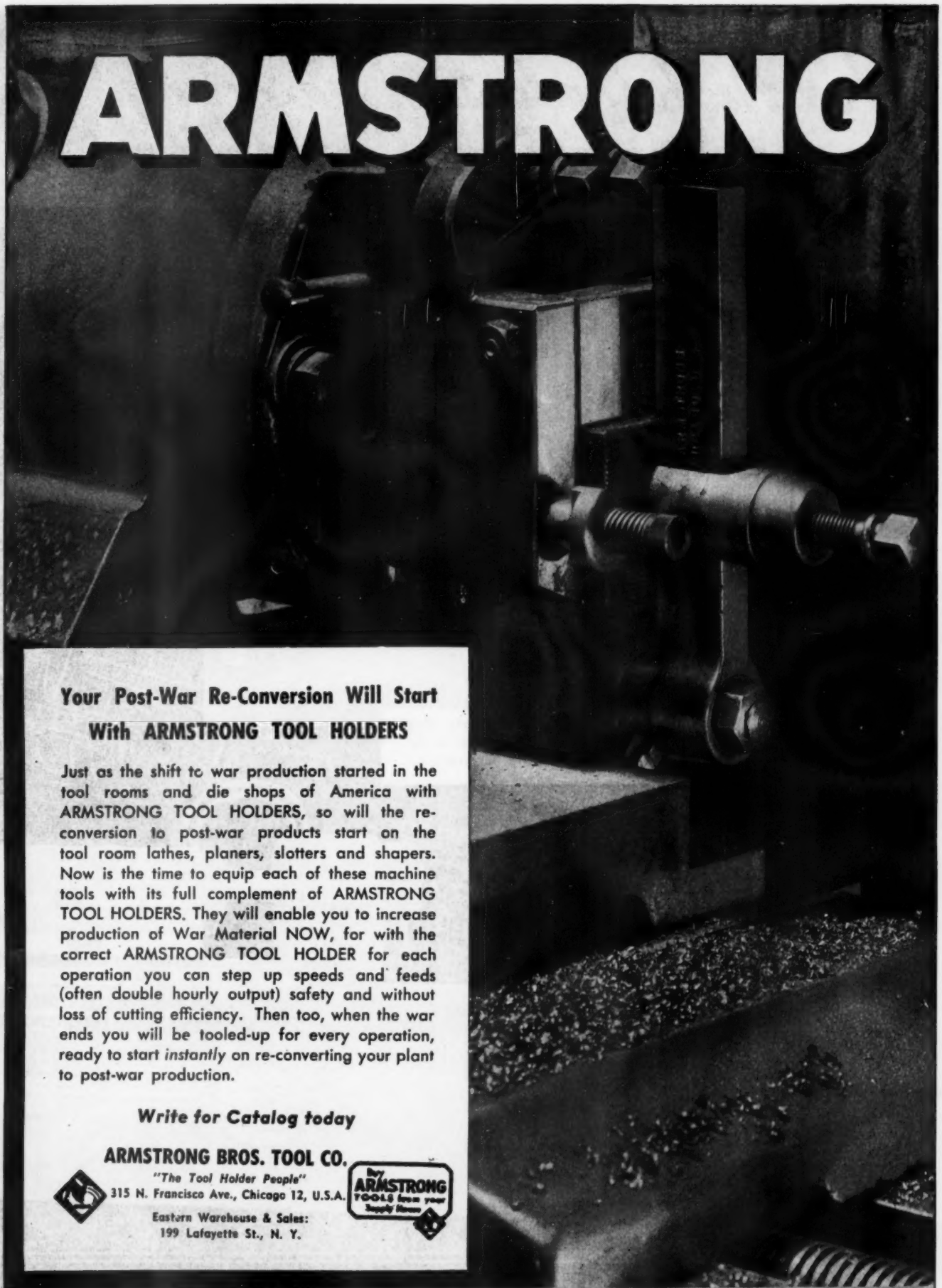
METRO

TOOL AND GAGE CO.

4240 Peterson Avenue

Chicago 30, Illinois

ARMSTRONG



Your Post-War Re-Conversion Will Start With ARMSTRONG TOOL HOLDERS

Just as the shift to war production started in the tool rooms and die shops of America with ARMSTRONG TOOL HOLDERS, so will the re-conversion to post-war products start on the tool room lathes, planers, slotters and shapers. Now is the time to equip each of these machine tools with its full complement of ARMSTRONG TOOL HOLDERS. They will enable you to increase production of War Material NOW, for with the correct ARMSTRONG TOOL HOLDER for each operation you can step up speeds and feeds (often double hourly output) safety and without loss of cutting efficiency. Then too, when the war ends you will be tooled-up for every operation, ready to start *instantly* on re-converting your plant to post-war production.

Write for Catalog today

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

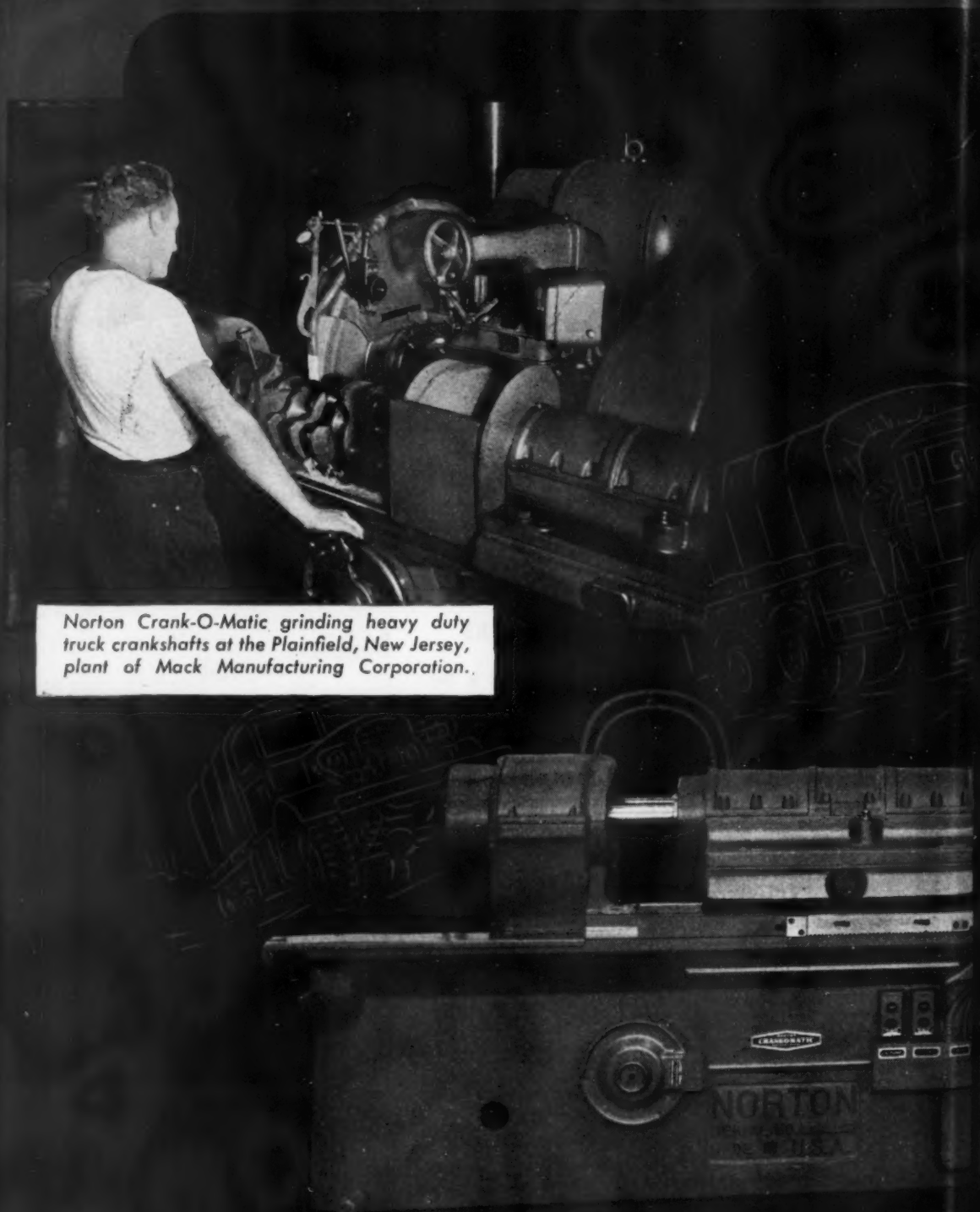
315 N. Francisco Ave., Chicago 12, U.S.A.

Eastern Warehouse & Sales:
199 Lafayette St., N. Y.

Buy ARMSTRONG TOOLS from your Supply Stores

ARMSTRONG TOOL HOLDERS Are Used In Over 96% of the Machine Shops and Tool Rooms

For High Production Grinding
on Heavy Duty Crankshafts . . .



Norton Crank-O-Matic grinding heavy duty truck crankshafts at the Plainfield, New Jersey, plant of Mack Manufacturing Corporation.

. . . NORTON CRANK-O-MATIC

THE NORTON CRANK-O-MATIC* Machine is outstandingly popular with manufacturers of automotive, airplane and marine motors for grinding crankpins.

It is an easy-to-operate machine, capable of grinding at an extremely rapid rate.

Features:

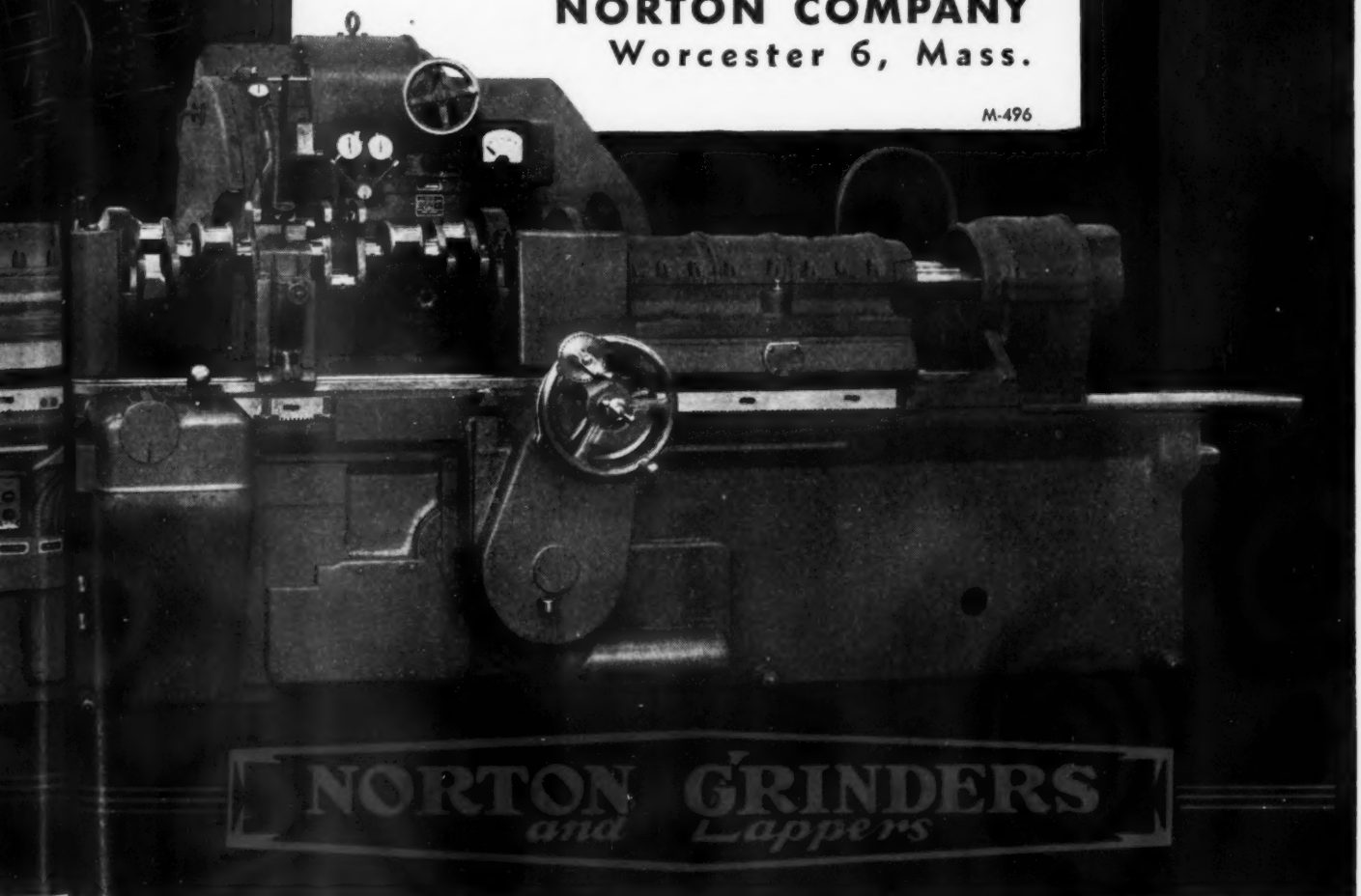
- **Single control lever, conveniently located and easily moved, controls the machine's principle functions.**
- **Work table is moved hydraulically.**
- **"Spark Splitter" allows operation by lever or hand wheel control to guide wheel exactly between shoulders. No jogging of heavy table by hand.**
- **Time and energy reduced — less effort and fatigue for operator.**

Consult the Norton Engineering Department with your grinding problems.

* Formerly known as Model D-86

NORTON COMPANY
Worcester 6, Mass.

M-496



NORTON GRINDERS
and Lappers

A SPECK OF STEEL LODGED IN AN EYE . . . CAN COST MORE THAN A DIAMOND

Valueless in itself, this speck of steel became costly in the split second it took to cause an eye accident. The final bill was $343.00.*

An adequate eye-protection program demands a place in every *cost reduction* program. And, because American Optical Safety Goggles are light, cool, comfortable and easy-to-wear, their protection is now readily accepted by workers in every field of industry.

Ask your Safety Director to consult with an A. O. Safety Representative. There is an American Optical Branch Office in every large industrial center.

*Average cost of compensation and medical treatment for eye accidents, according to insurance company figures.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

UNBELIEVABLE PERFORMANCE ON CARBIDE-TIPPED TOOLS!

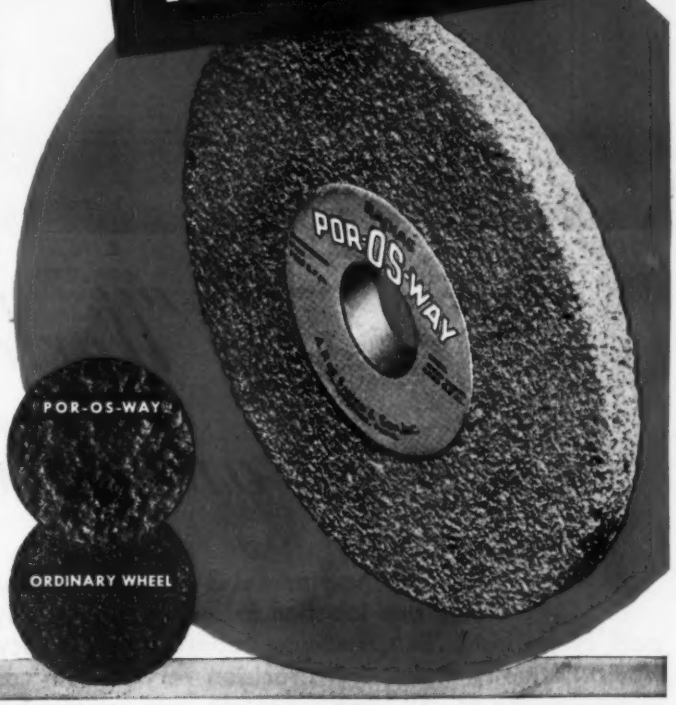
Green silicon carbide is back from the war in Por-os-way wheels for carbide-tipped tool grinding. Put it to work! You'll actually be amazed at its performance—bringing you 2 to 5 times faster, cheaper grinding without burning or discoloring!

2 TO 5 TIMES LOWER GRINDING COSTS

YOU'VE got a happy, satisfied crowd of machinists when you let them go to town with Por-os-way—the open structure grinding wheel that cuts deeper, faster, *cooler.* Machinists *go* for it! They like it—the way it bites through toughest metals like lightning, the way it cuts down rejects, the way it stays clean and lasts longer. And, brother, in the days ahead *when costs must be cut to the bone*—you'll go for Por-os-way, too! It's one sure way to get the edge on competition—and a hatful of praise from the boss. Call in a Por-os-way engineer and make us *prove* we're right when we say, "No wheel has yet bettered a Por-os-way!" A. P. de Sanno & Son, Inc., 430 Wheatland Street, Phoenixville, Pa., Since 1893.

LOOK AT THE DIFFERENCE!

Your eye tells you at a glance why Por-os-way is *different.* See the *extra porosity* that gives you over 8 distinct operating advantages!



RADIAC*

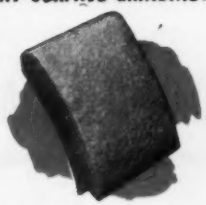
POR-OS-WAY*

The Precision Grinding Wheel

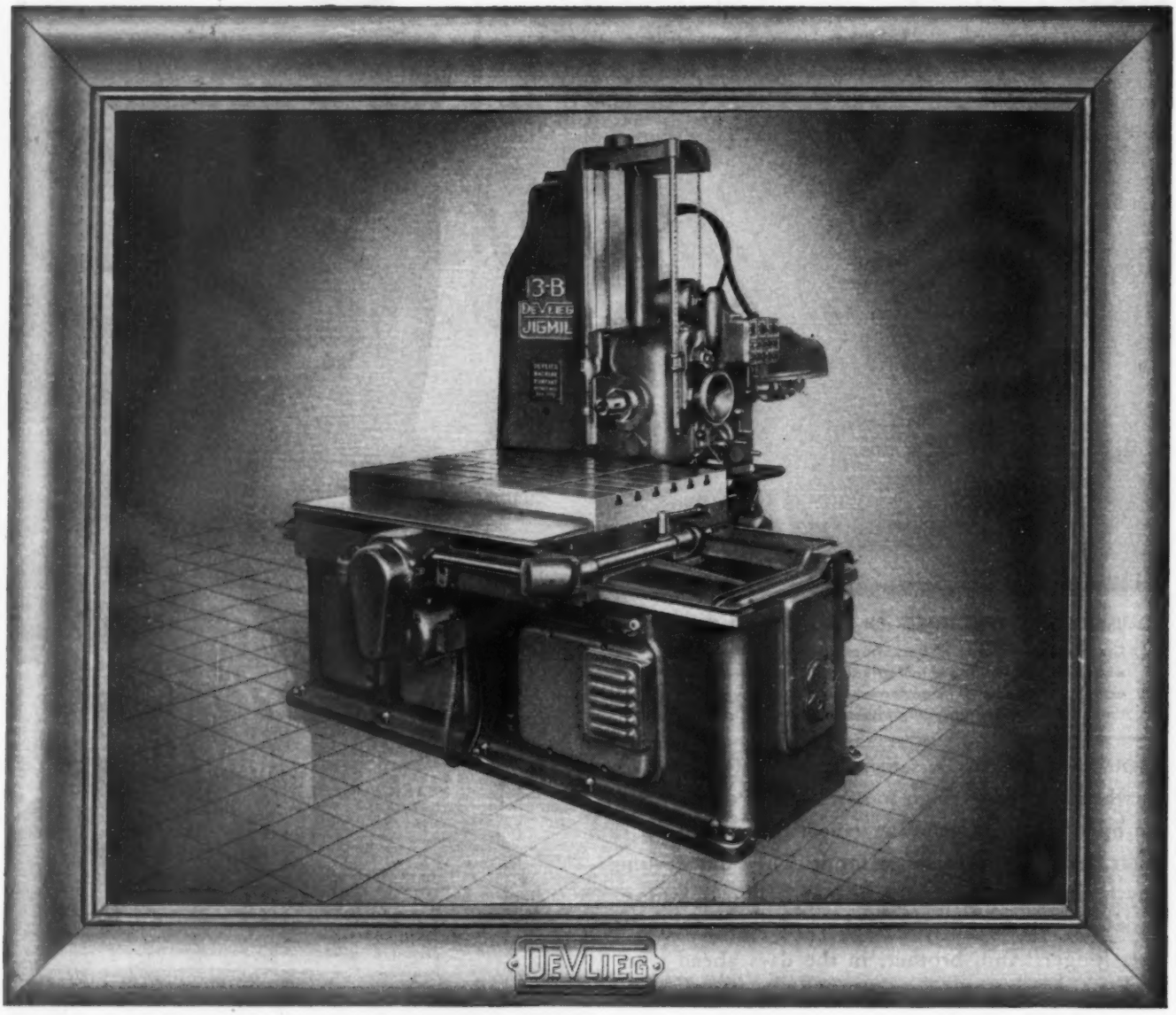
THE WHEEL THAT COSTS THE MOST AT FIRST . . . COSTS THE LEAST AT LAST

NO GROAN, NO MOAN, NO GRUNT IN POR-OS-WAY SURFACE GRINDING!

Try Por-os-way segments for surface grinding. Notice the greatly increased speed, notice how quietly the cutting edges of Por-os-way dig deep into the metal. Por-os-way *cuts,* doesn't "scrape" the surface! Time out for dressing is greatly reduced, too!



*T. M. Reg. U. S. Pat. Off. Copyright, 1945 A. P. de Sanno & Son, Inc.



The World's Finest Boring and Milling Machine

THIS new model 3-B JIGMIL has automatic power means to position the spindle from one location to another accurately to within much less than .0001 (one-ten thousandths part of an inch). Thus, extreme laboratory accuracy is conveniently available with ordinary skill that would normally make such precision very high in cost. This, and many other refinements, go further to prove that the JIGMIL idea is a totally new approach to the problems of precision boring at a new low cost.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

MANUFACTURING

CONTROL

THE KEY TO UNIFORM CARBIDES

THE art of manufacturing uniform cemented carbides requires the same "exceeding care" exercised by the talented research men who established the fundamental principles and practices of this highly specialized branch of metallurgical science. That is why Kennametal is subjected to precise control throughout every stage of its manufacture, by means of scientific instruments in the hands of skilled technicians. The objective of the chemical and metallurgical checks of processing is three-fold:

First, *to produce cemented carbides that will exactly suit predetermined requirements of differing character.*

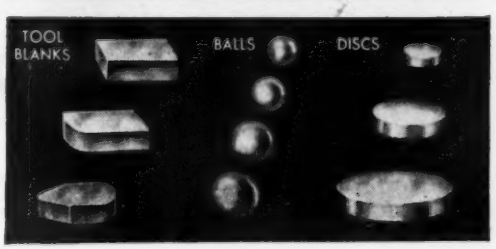
Second, *to assure that the desired characteristics of finished products are uniformly maintained.*

Third, *to form the basis for continued research looking to still further improvement in the properties and applicability of Kennametal.*

● The invention and development of Kennametal—a scientific achievement—has led to corresponding useful arts. Kennametal's ability to cut hard metals with sustained accuracy, at greatly increased speed, has made major contribution to the technique of high production machining and milling. Its unique wear-resistant properties have created opportunity which many manufacturers have seized upon to give their products greater serviceability.

The technological advancements that accompany the use of Kennametal serve to suggest the tremendous potential benefits to society that are always inherent in a system under which inventive genius is granted the rights, and given the means, to encourage full utilization of its talent.

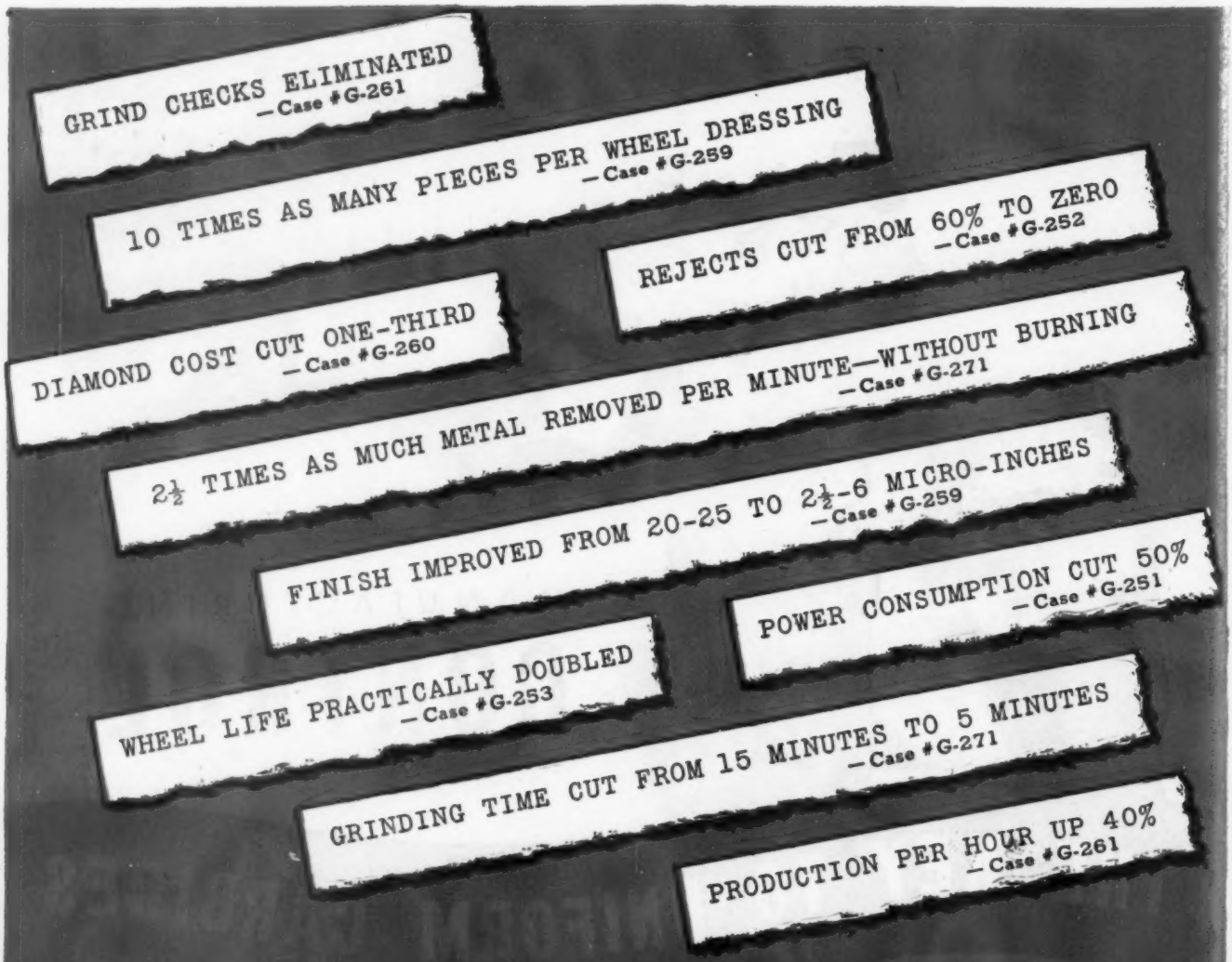
Typical **KENNAMETAL** *Products*



KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL *Inc.*, LATROBE, PA.


GRIND CHECKS ELIMINATED
—Case #G-261
10 TIMES AS MANY PIECES PER WHEEL DRESSING
—Case #G-259
REJECTS CUT FROM 60% TO ZERO
—Case #G-252
DIAMOND COST CUT ONE-THIRD
—Case #G-260
2½ TIMES AS MUCH METAL REMOVED PER MINUTE—WITHOUT BURNING
—Case #G-271
FINISH IMPROVED FROM 20-25 TO 2½-6 MICRO-INCHES
—Case #G-259
POWER CONSUMPTION CUT 50%
—Case #G-251
WHEEL LIFE PRACTICALLY DOUBLED
—Case #G-253
GRINDING TIME CUT FROM 15 MINUTES TO 5 MINUTES
—Case #G-271
PRODUCTION PER HOUR UP 40%
—Case #G-261

QUAKER MICROGRIND PROCESS

May we send you complete details on each of these actual production grinding operations? Just use the handy reply form provided below. Results like these are being enjoyed regularly in many leading plants employing this truly revolutionary grinding process. On request, a Quaker Process Engineer will be pleased to call and apply the QUAKER MICROGRIND PROCESS on the toughest grinding job in your shop and explain the radically different principles involved.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

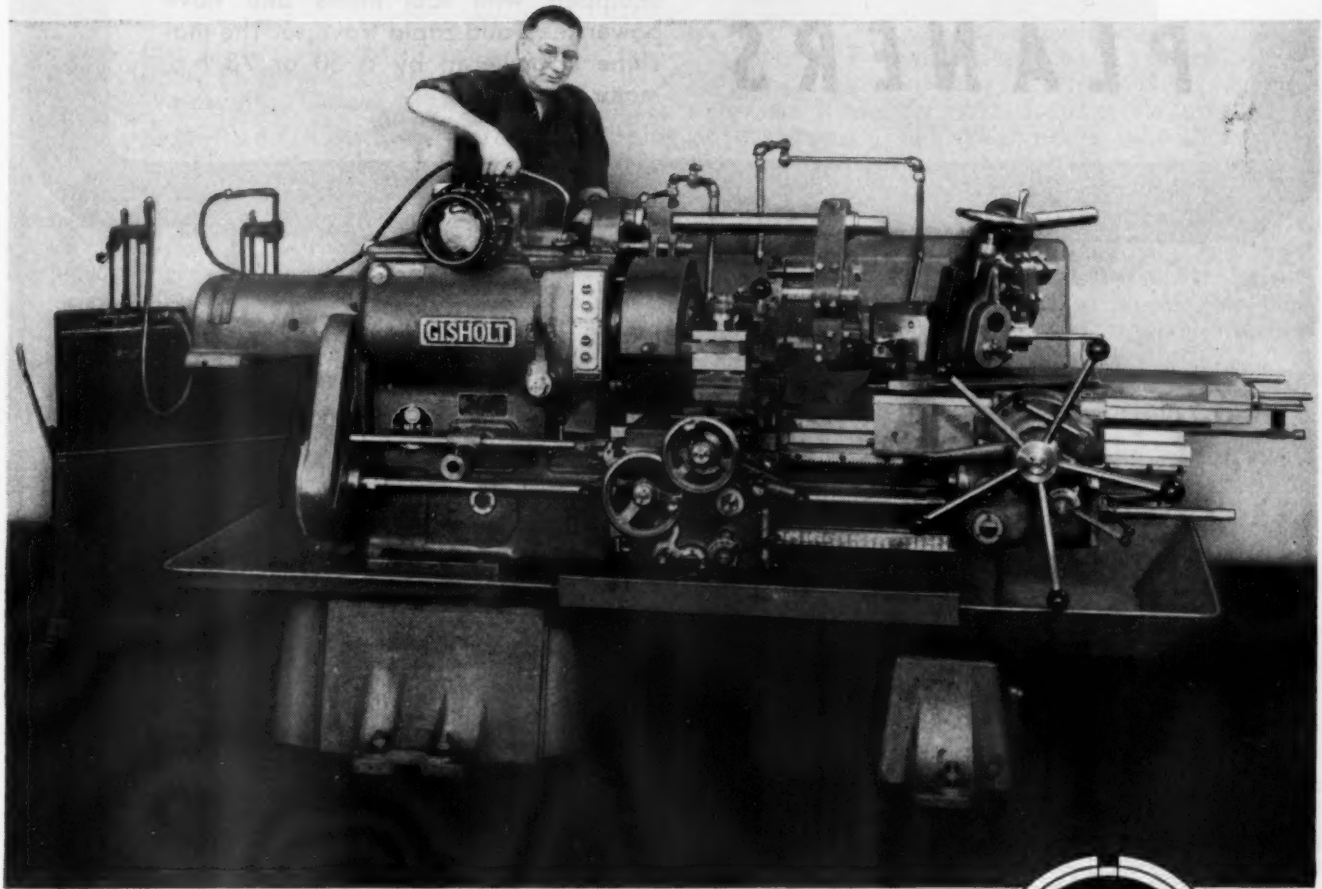
Other Plants in CHICAGO and DETROIT Warehouse Stocks in Principal Industrial Centers

A Progressive Organization of Research and Process Engineers and Manufacturing Chemists

Name_____ Position_____

•••PLEASE PRINT COMPANY NAME AND ADDRESS IN MARGIN BELOW•••

HOW MANY "MILES" for the Oil in your TURRET LATHE?

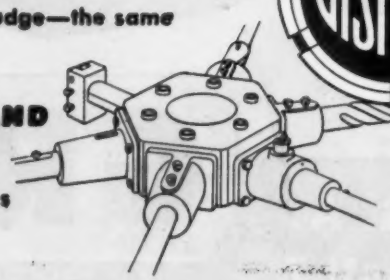


✓ **CHANGE OIL IN RESERVOIRS REGULARLY**

The oil in your turret lathe *wears out*—turns into sludge—the same as the oil in your car.

✓ **USE ONLY RECOMMENDED GRADES AND TYPES OF OIL**—Cheap oil is never cheap. Incorrect grades of oil can gum up fine oil passages and result in serious and expensive trouble.

GISHOLT

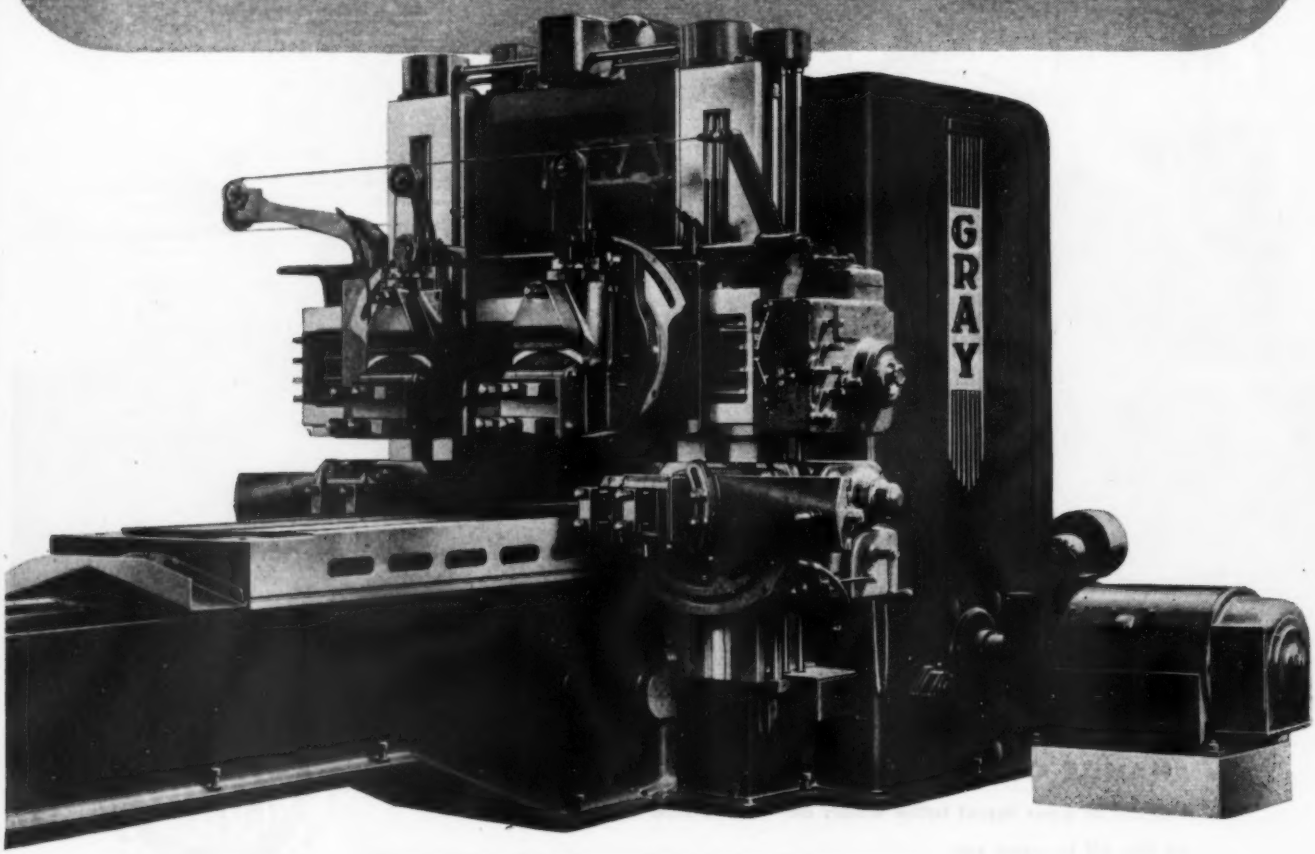


✓ *Reproductions of this page on enameled paper are available in 8¼" x 10½" size for bulletin-board use in your turret lathe department. Write the Gisholt Machine Company, 1207 East Washington Avenue, Madison, Wisconsin. Ask for the series of "Wartime Care and Operation Posters." State quantity desired.*

Designed for a tough Job . . .

GRAY DIE-BLOCK PLANERS

● The demand for hard—tough die blocks has increased enormously due to our war demands. The Gray Die-Block Planer was designed for this type of work. It will face, side plane and shank die blocks in the shortest possible time. All heads are of swivel type, are equipped with tool lifters and have power feed and rapid traverse. The machine is powered by a 50 or 75 h.p. motor.



GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

Through recent explorations our known reserves of bauxite (source of aluminum) have been increased by more than 100 million tons. *Science News Letter.*

get ready with CONE for tomorrow

The National Postwar Products Exposition is scheduled to open March first at the Chicago Coliseum. *Marcus W. Hinson, Ex. Mgr. 1513 S. Wabash Ave., Chicago 5.*

get ready with CONE for tomorrow

A new tractor-drawn farm implement plows, discs and harrows in one operation. *"Till-Master", Till-Master Mfg. Co., Portland, Oregon.*

get ready with CONE for tomorrow

Today's scientists have revived a four-thousand year old method of killing insect pests with fine dusts. These dusts adhere to the insect's skin or casing and interfere with its water balance. Death results from thirst. *Dr. H. V. A. Briscoe, Imperial College, London.*

get ready with CONE for tomorrow

A railroad now has one-hundred plywood box cars and one thousand on order. The weight saving is said to be about two tons per car. *Great Northern Railway.*

get ready with CONE for tomorrow

A new "de-barker" is being used in some pulp mills that removes the bark from logs by the force of a jet of water at 650 pounds pressure without removing any wood. The saving in wood is said to be as high as 20%. *Scientific American, Oct. 1944.*

get ready with CONE for tomorrow

The continuous injection molding of plastics is made possible by a new machine. *Chrysler Corp.*

get ready with CONE for tomorrow

A new electric iron requires no cord but absorbs heat from an electrically heated and thermostatically controlled base. *Eureka Vacuum Cleaner Co., Detroit.*

Jet propulsion may be used to power sailplanes and gliders and, in miniature, for flying models. *McGraw-Hill Overseas' Digest.*

get ready with CONE for tomorrow

A university engineer has announced the discovery of a new type of concrete, useful for building construction, that is stronger than steel and lighter than aluminum. *Northwestern University.*

get ready with CONE for tomorrow

A new $1,800, four-room house will come directly off the assembly line on to a truck for delivery. *"Wingfoot Homes", Goodyear Tire and Rubber Co.*

get ready with CONE for tomorrow

A "zipper" fastening has been developed that is claimed to seal in liquids and gases. *B. F. Goodrich Co.*

It has been stated that the weight of aircraft engines has been reduced about 40% since the beginning of the war. *Aircraft Yearbook 1944.*

get ready with CONE for tomorrow

Manufacturers of the "jeep" plan to sell it to farmers and are reported to have ordered 25,000 bodies for this purpose. *Willys Overland.*

get ready with CONE for tomorrow

A machine has been patented for making barrels out of cardboard for packing butter, flour, sugar, chemicals, fruits, or small parts. *Everett Industries, Akron.*

get ready with CONE for tomorrow

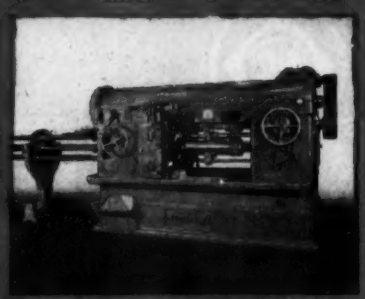
Aviation and electrical engineers are collaborating on an electric drive for aircraft. This will, if practical, permit the location of engines in the fuselage and do away with nacelles in the wings. *Hughes Aircraft Co. and Westinghouse.*

get ready with CONE for tomorrow

One of the country's largest grocery chains is planning to ship fresh fruits and vegetables to its markets by airplane. *A & P.*

Here is performance that is definitely AHEAD

This part calls for extreme accuracy and yet requires wide forming cuts on a variety of diameters. In one position an attachment taps an inside thread 5/16"-18 while, at the same time, a die cuts an outside thread 5/8"-27. Produced on the 6 Spindle Conomatic at the rate of 12.5 seconds per part.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

14

It's easy to pick the wrong electrode...

HE'S A WELDER AND SELECTS ELECTRODES ACCORDING TO THEIR CLASSIFICATION NUMBER
..BUT HE'S CONFUSED BY THE VARIOUS TRADE NAMES AND NUMBERING CODES
THIS IS SILVER FOX #5
98 B ?
AND THIS IS FLASH KING
?
HOW ABOUT TYPE 922 ?

That's why Allis-Chalmers uses AWS numbers...

EVERY user of arc welding electrodes has been confronted with this same puzzling situation. Each electrode manufacturer seems to have his own trade name — his own numbering code.

To eliminate this confusion Allis-Chalmers adopted standard American Welding Society classification numbers for the new line of welding electrodes. With the aid of this *official* numbering code correct selection is simple and foolproof.

Shop-tested and production proven in Allis-Chalmers own huge plants, these rods are available *now* at your nearby Ampac dealer or A-C district office. Bulletin B6340 has complete information.

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

A 1778

HEADQUARTERS FOR WELDING EQUIPMENT

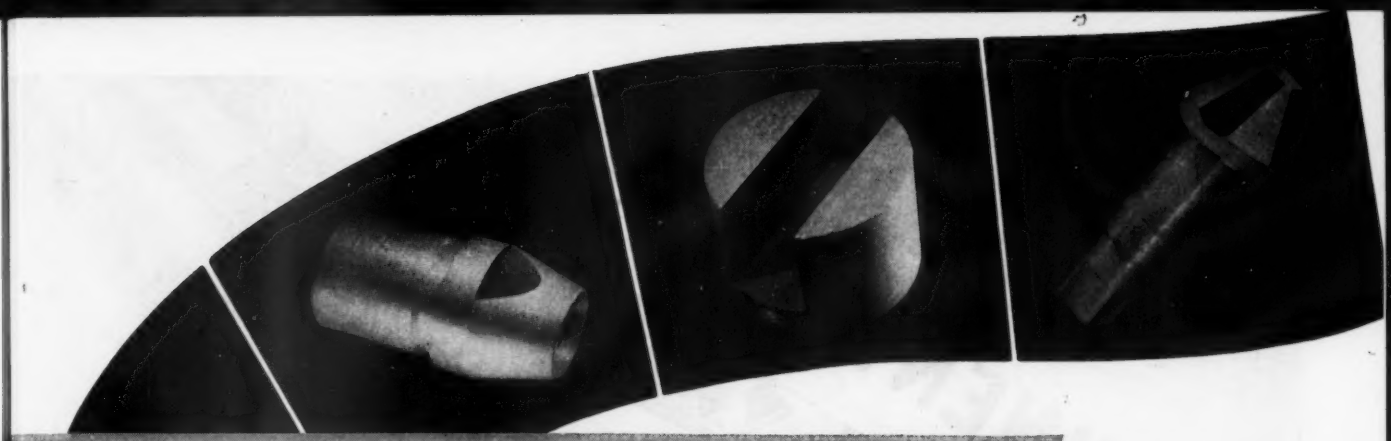
AMPAC A-C WELDERS

WELD-O-TRON D-C WELDERS

ALLIS-CHALMERS ELECTRODES

ARC WELDING ACCESSORIES

Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.



PRODUCTION 2000 PIECES PER HOUR WITH FOOTBURT *Surface Broaching* MACHINES

● If you require high production per machine to meet competitive costs on small machined parts you will be interested in Footburt Surface Broaching Machines. These parts may all be surface broached as shown at rates of 2,000 pieces per hour. Accurate finish, low tool maintenance costs and convenience in operation combine to make this machine attractive. Send your blueprints for analysis by the pioneers in surface broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

THE SCHEDULE

☆

WAR QUICKER

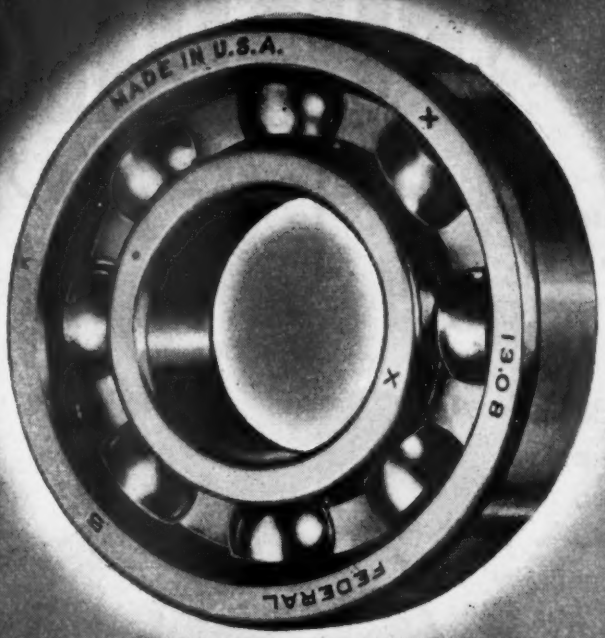
Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*

WHETHER it's a single or multi-tipped tool, whether or not you have a print of the specific tool you need, Ex-Cell-O's Continental Tool Works Division can give you exactly what is required in a tungsten carbide application. . . . Write for Bulletin No. 11132.

EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT • R.R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • AIRCRAFT AND MISCELLANEOUS PRECISION PARTS

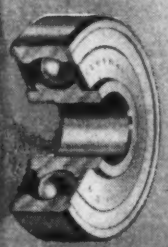


First on your list

FOR FUTURE PRODUCTION

FEDERAL
BALL BEARINGS

WHEN PLANNING RECONVERSION . . . KEEP FEDERALS IN MIND. THE FEDERAL LINE INCLUDES FINE BALL BEARINGS FOR AUTOMOTIVE, AIRCRAFT, INDUSTRIAL AND MARINE SERVICE.



THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
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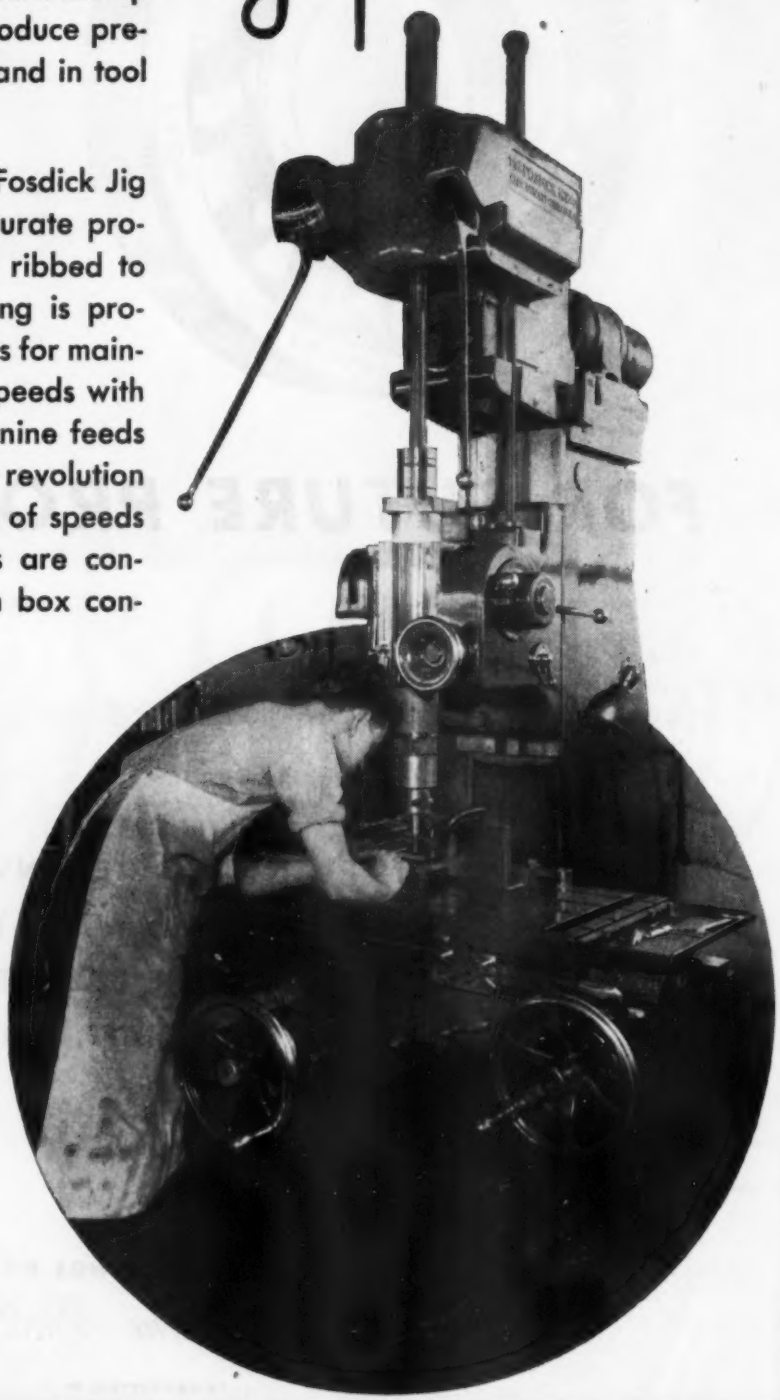
For Tool Room Accuracy FOSDICK Jig Borer

● The machine is ruggedly built from base up insuring the rigidity necessary to produce precision work required in tool rooms and in tool and die shops.

From a construction standpoint the Fosdick Jig Borer has all the essentials for accurate production. The sturdy bed is heavily ribbed to avoid distortion—three point bearing is provided for leveling and leveling screws for maintaining perfect alignment. Twelve speeds with a range of 60 to 1500 R.P.M. and nine feeds from .00125 inch to .010 inch per revolution of spindle provide a wide selection of speeds and feeds. Both feeds and speeds are controlled by a single lever from each box conveniently located for the operator.

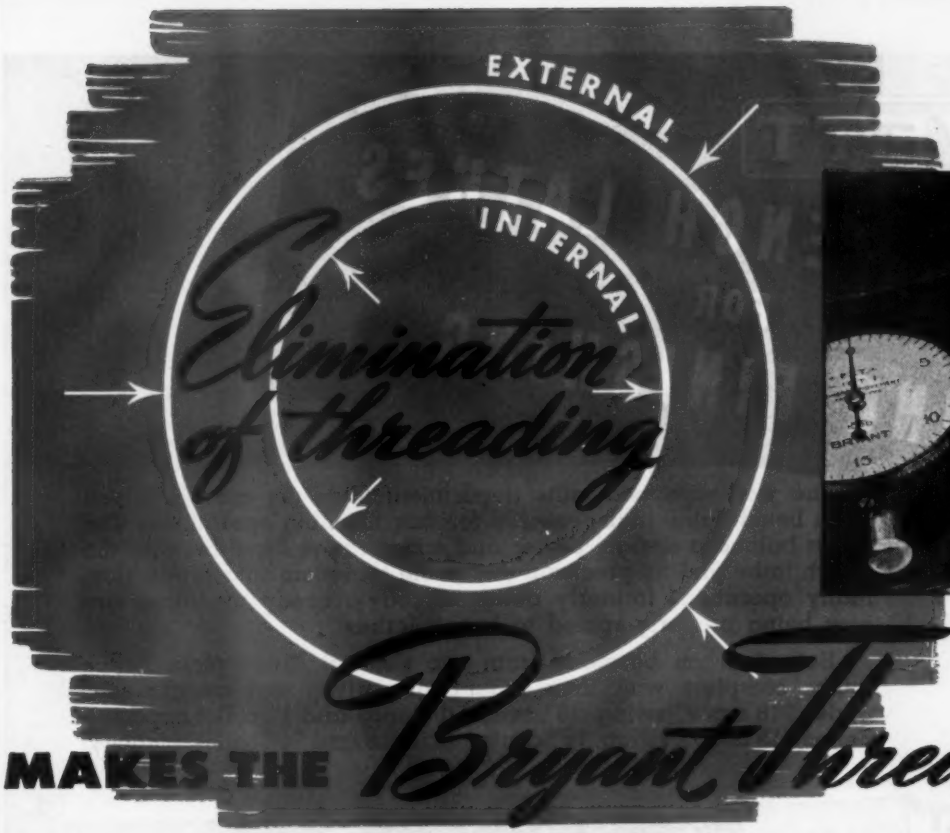


Illustrated is a Fosdick Jig Borer performing a precision boring operation in a mid-western tool and die shop.

The Fosdick Jig Borer is ideally suited to tool room and tool and die shop operations. It is adaptable to a wide range of precision operations at costs that are exceptionally low.

For your precision boring-reaming counterboring and similar work consult Fosdick. A Fosdick Jig Borer Bulletin J. B. A. is available. Write for a copy.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO



MAKES THE Bryant Thread Gage

4 TO 5 TIMES FASTER THAN PLUG OR RING GAGING

Bryant Thread Gages completely eliminate tedious, time-consuming threading of gages into or onto parts being inspected.

When inspecting internal parts, the segments are retracted by the control lever — the work is dropped over the segments — the control lever is released, and *immediately* engagement is made on *all the threads.* A *partial* turn of the work indicates overall accuracy within required tolerances, or accumulated inaccuracies of lead, taper, pitch diameter, thread form or the presence of burrs. External threads are inspected in the same manner, except that the segments are expanded to allow the part to be dropped inside.

The unique design of Bryant Thread Gages practically eliminates wear on the segments — it allows inexperienced help to inspect threaded parts four to five times faster than experienced inspectors using conventional gages — it eliminates the "feel" required in plug and ring gaging — it offers a method for complete, overall inspection of master plug and ring gages, and a method of transferring their accuracy to production threaded parts.

Write today for illustrated folder No. G2 which gives complete details.

BUILT IN 3 STANDARD MODELS

Bryant CHUCKING GRINDER COMPANY

SPRINGFIELD, VERMONT, U. S. A.

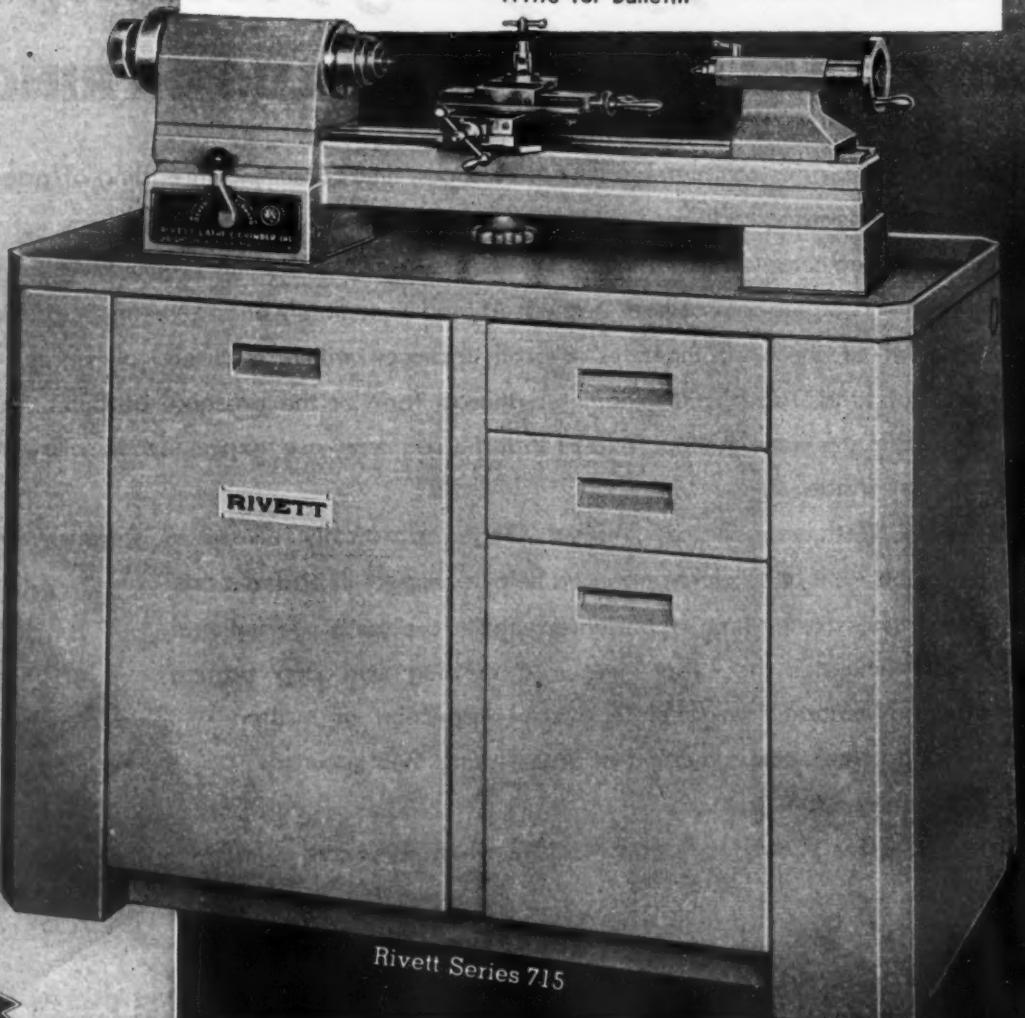
RIVETT

PLAIN BENCH LATHES FOR FINE FINISHING

The well equipped lathe department finds the modern Rivett plain bench lathe indispensable for fine finishing operations. The Rivett balanced design, power and speed range have brought the bench lathe and its precision out of the tool-room into production. Many operations formerly done on heavy, costly machines are now being properly routed to bench lathes.

Selection can be made from two sizes of Rivett plain bench lathes complete with their mountings, drives and attachments. Series 918 has 9" swing, 18" center distance and 1" collet capacity. Series 715 has 7" swing, 15" center distance and ¾" collet capacity.

Write for Bulletin



Rivett Series 715

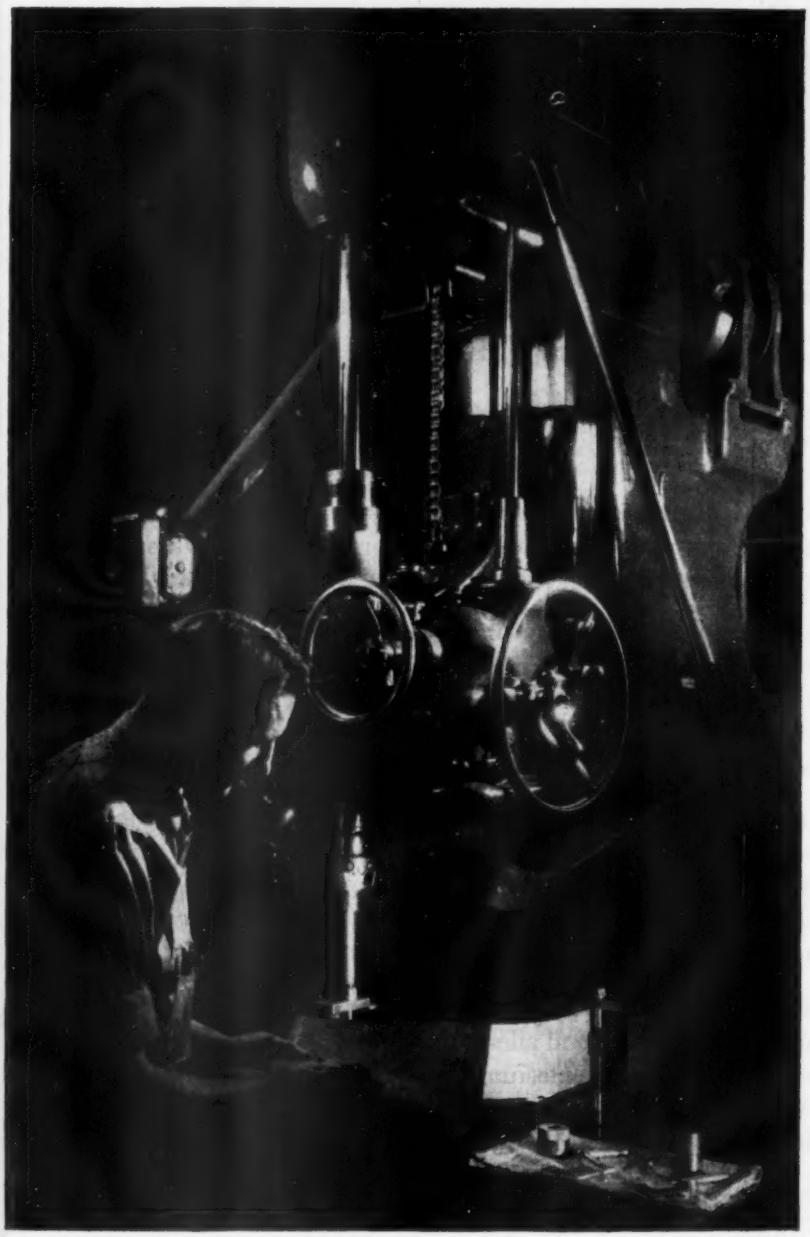
ARMY E NAVY

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

READY FOR *Peace...*

THE DAY IT WENT TO **WAR**



No reconversion, no retooling, no rebuilding will be needed to swing the P&W Jig Borer over to peacetime service. War or Peace find it always ready, capable and efficient . . . its built-in accuracy on tap for precision boring.

Since World War I, Pratt & Whitney Jig Borers have been on the job. They were the first machines designed from the ground up for the particular job of precision boring. And they have been improved constantly over the years as new techniques developed. Today they top the list of "musts" for any well equipped tool shop.

The great precision and dependability of this machine make it a shop tool of extra value when used as a *"jig eliminator" on small lot precision boring jobs.*

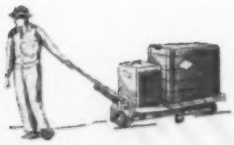
War or Peace — the Pratt & Whitney Jig Borer performs with unfailing *accuracy* in producing more, producing better, eliminating waste, lowering costs. Write for full details.

● Pratt & Whitney Jig Borers are recognized by those who use them as the finest precision machines ever built. Thousands of products have been successful because the production tools that built them derived their initial accuracy from a Pratt & Whitney Jig Borer.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

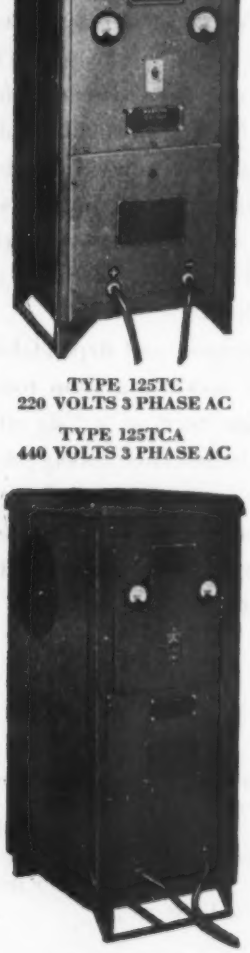
WEST HARTFORD 1, CONNECTICUT



TYPE 50TC
AND TYPE 100TC
115 OR 230 VOLTS
SINGLE PHASE AC

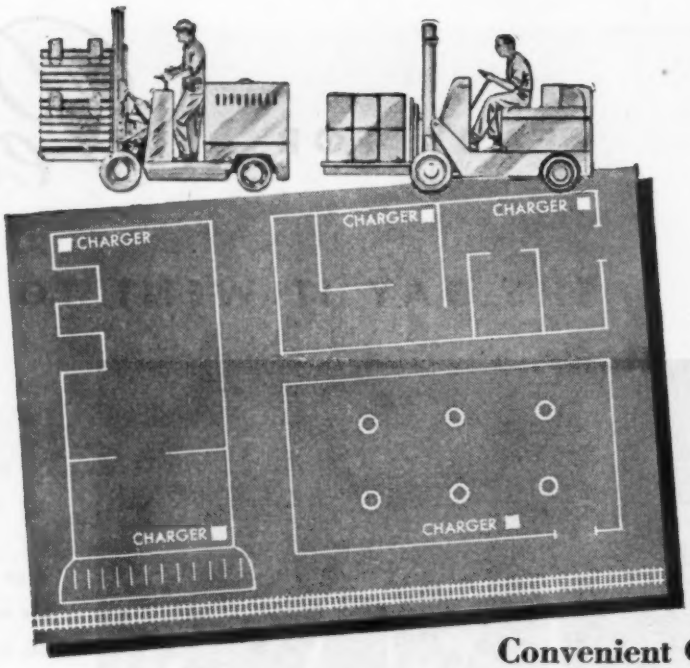
TYPE 125TC
220 VOLTS 3 PHASE AC

TYPE 125TCA
440 VOLTS 3 PHASE AC



TYPE 175TC
220 VOLTS 3 PHASE AC

TYPE 175TCA
440 VOLTS 3 PHASE AC



Convenient Charging for Lead or Nickel-Iron Industrial Truck Batteries with

MALLORY Battery Chargers

Many users of industrial electric trucks have found it both economical and convenient to install several Mallory Automatic Battery Chargers, located at focal points of truck operation.

No special bases or floor mountings are required. Thus a Mallory Battery Charger may be placed in the plant wherever operating conditions demand. Long runs back to a central charging station are avoided. Time is saved, as well as battery power. "Tow-ins" can be eliminated.

Operation of Mallory Battery Chargers is automatic. The truck operator merely plugs the charger into the battery, and turns the control knob. No further adjustments or readings are necessary. An electric cut-off disconnects both AC and DC circuits automatically when charging is completed.

Mallory Battery Chargers speedily charge either lead or nickel-iron batteries. Long life and silent operation are assured by rectification with Mallory magnesium-copper sulphide dry disc rectifiers. With no moving parts, these rugged units give years of trouble-free service.

For complete information, see your nearest Mallory Distributor. Or write us.

P. R. MALLORY & CO., Inc.,
INDIANAPOLIS 6, INDIANA

ARMY E NAVY

*Rectostarter is the registered trademark of P. R. Mallory & Co., Inc., for rectifier units for use in starting internal combustion engines.

P R MALLORY & CO Inc

MALLORY RECTIFIERS

MAGNESIUM COPPER SULPHIDE RECTIFIERS—
STATIONARY AND PORTABLE D. C. POWER SUPPLIES—
BATTERY CHARGERS AND AVIATION RECTOSTARTERS*

SECOMET

DIAMOND WHEELS

ARE HELPING TO SHAPE A *Better World*

Carbide tipped tools in the few war production years have played a major role in shaping the implements of war and will reach new heights in importance in shaping the metal parts of a more peaceful world.

Diamond wheels are the only means of keeping carbide tipped tools accurately sharpened. Sufficient quantities of bortz diamonds have been acquired by J. K. Smit & Sons for diamond powder for these wheels and many other types of industrial diamond tipped tools.

Members of the staff of J. K. Smit, leaders in the industrial diamond field for more than a half century, have played no small part in paving the way for making available to the entire industry the vast quantities of diamonds required for war production.

ARMY (E) NAVY

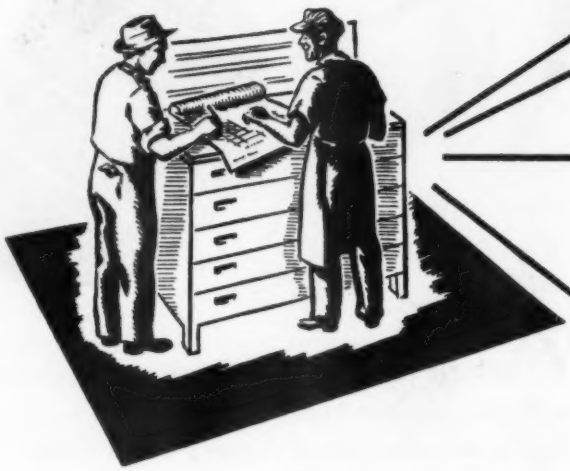
● Secomet diamond wheels are made from powder reduced from whole diamond bortz by an intricate scientific process developed by J. K. Smit engineers. Uniform grit sizes ranging from standard 60 to 400 with 500 to 5000 grit available, provide the proper surface for any type of tool. Straight cup, flaring cup, dish and other standard wheel types as well as hones are available in resinoid and metal bonds. Send for the new Secomet Diamond Wheel Price List Bulletin No. 45.

J. K. SMIT & SONS, Inc.

157 Chambers St., New York 7, N.Y. 6400 Tiremen Ave., Detroit 4, Mich.

DIAMOND WHEELS • TOOLS FOR DRESSING WHEELS • CORE BITS • METAL WORKING TOOLS • POWDER

You Get Corrosion Resistance *Plus* EASY, ECONOMICAL FABRICATION with Carpenter Stainless



When you consider putting new zest, greater "eye" appeal into your new or redesigned products—when you consider giving them greater strength and a higher factor of safety—when you consider endowing them with special physicals to meet unusual service conditions—the first thing that comes to mind is "Let's make it from Stainless."

But beyond these immediate sales and utility advantages, you want Stainless Steels that will work with you right from the start.

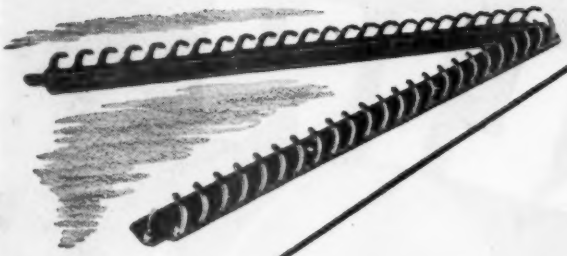
Easy-working Carpenter Stainless Steels for instance, can help your shop get into production faster. Because they form easily, blank cleanly and permit faster press and machining speeds, they smooth the way from drawing board to finished product. In addition, these Stainless Steels save time and expense in the finishing room.

Carpenter has spared neither time nor expense to bring you the easiest fabricating Stainless Steels that ever hit your production line. The same group of Stainless experts who helped make possible ductile, easy-working Stainless Strip and Free-Machining Stainless bar stock are ready to apply their experience to your problems. Let them help you select the proper Stainless for the job. Let them help you cut corners and costs in your fabricating shop.

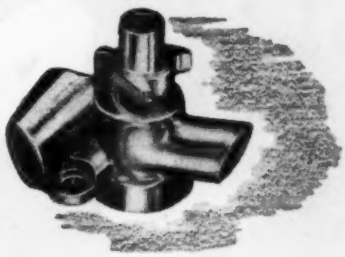
Call in your nearby Carpenter representative now, or write us at the mill. And if you do not already have a copy, send for our 98-page book, "Working Data for Carpenter Stainless Steels." A note on your company letterhead, indicating your title, is all that is necessary.

Give Your Products These Advantages

- Sales Appeal
- Everlasting Beauty
- Freedom from Rust
- No Plating to Peel
- Weight Saving
- Strength and Rigidity
- Ease of Assembly
- Fewer Service Complaints



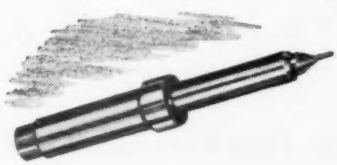
SAME DIES as were previously used to form and blank ordinary cold rolled strip, later made this ingenious Stainless loose leaf binder. Ductile, uniform Carpenter Stainless #6 assured clean stamping, easy crimping, smooth bends. In addition, this satin-finish Stainless eliminated all polishing operations.



LOWER UNIT COSTS This aircraft fuel supply valve body was forged from Carpenter Stainless #8 forging bars. Our *machine-turned* billets from which all Carpenter Stainless forging bars are rolled, assure freedom from surface defects. The result: sound, flawless forgings for you, with minimum rejects.

PERMANENT "EYE" APPEAL When manufacturers of equipment like fishing reels want to give their products lasting beauty that never peels off, or becomes marred by rust, their natural choice is Stainless. And when the job combines forming, stamping and machining operations, they find Carpenter Stainless Steels save time and expense through every step of fabrication.

NO PROCESS ANNEALING Ordinarily a difficult deep-drawing job like this could cause plenty of headaches and expense. But with Carpenter Stainless #6 the cups were easily deep drawn and without process annealing. Do any parts for your postwar products involve deep-drawing? If they do, investigate easy drawing Carpenter Stainless Strip.



AUTOMATICS USED This airplane part, machined in automatics from Carpenter Stainless #8 bar stock, indicates what can be done with Free-Machining 18-8 Stainless.

THE CARPENTER STEEL COMPANY, 109 W. BERN ST., READING, PA.

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

AFTER exhaustive tests Macklin has developed a new bond for silicon carbide vitrified grinding wheels for use in roughing Tungsten Carbide tipped tools. Many large plants have already found that these wheels marked, GC-60-I-8-V-5 give outstanding results. They are cooler cutting, require less dressing and, therefore give unusually long life. Also available in other grains and grades.

Ask for the services of an experienced Macklin Field Engineer who will, without obligation, assist you with your grinding problems. There is a Macklin wheel for every grinding job. Why not *"Protect your Production."*

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

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UNION
Roughing or finishing, forming or precise gear cutting, your machine tools will perform at maximum capacity and proficiency when the cutting tools are made by "UNION." Materials, workmanship, precision—these features make UNION "the tools you buy again"!
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REAMERS by Butterfield

Illustrated: Straight and Spiral Fluted Hand Reamers, Straight and Spiral Fluted Chucking Reamers, Straight and Spiral Fluted Expansion Reamers, Lok-Tite Expansion Chucking Reamers.

Butterfield assures you of dependable efficiency and the most rigid standards of accuracy — your guarantee of high-quality, trouble-free performances in heavy duty reaming operations.

Butterfield Division

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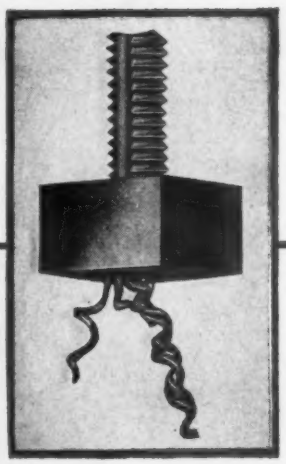
UNION ★ BUTTERFIELD ★ CARD



CARD

FREE-CUTTING SPIRAL POINTED HAND TAPS

Spiral pointed taps are designed for tapping through holes or in blind holes when drilled deeply enough to allow clearance for chips at the bottom of the hole. Card Spiral Pointed Hand Taps assure a smooth, free-cutting action, producing accurate threads of excellent quality. Note the outstanding Card feature illustrated at the left.

FORCING THE CHIPS *ahead* OF THE TAP . . .

Above is a detailed view of chip-action produced by Card Spiral Pointed Hand Taps. Long, curling chips are forced ahead of the Tap – avoiding clogging – increasing strength of Tap – reducing breakage.

S. W. CARD MFG. CO.
Mansfield, Mass.

STORES
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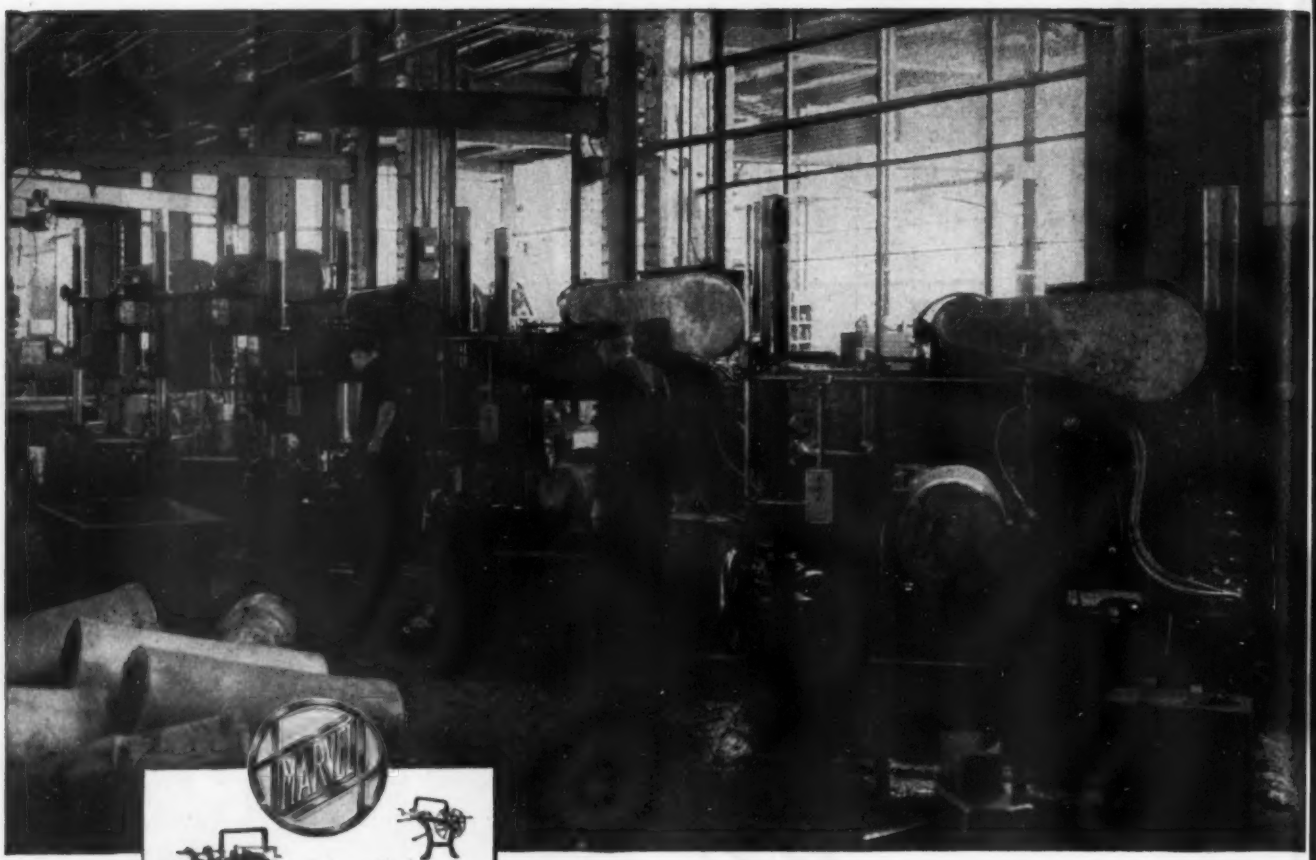


HACK SAW METHOD STEPS UP LOCOMOTIVE PRODUCTION

In the large shops of the American Locomotive Co., at Schenectady, wartime production has reached a new peak.

Among the improved methods contributing to this record output has been the increase in the use of the modern MARVEL Hack Saws for cutting-off even the largest work; for cutting-off car axles, wrist pins and all large forgings — work formerly done with more expensive methods and costlier equipment. One of the first to discover the efficiency and economy of the hack saw method for large work, this company ordered three No. 18 MARVEL Giant Hydraulic Hack Saws soon after these revolutionary Saws were first announced. Today, they are using twenty MARVEL Sawing machines, including eleven of these massive, ruggedly built, giant hydraulics.

MARVEL Saws are increasing the production of war materials in all parts of the country by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, call on the local MARVEL Engineer to recommend methods and equipment.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

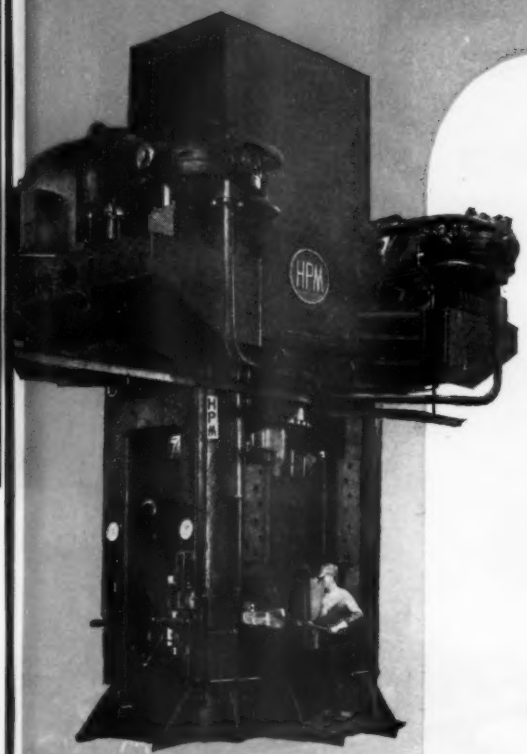
5700 W. BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

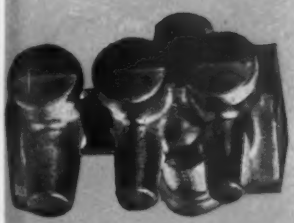
Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

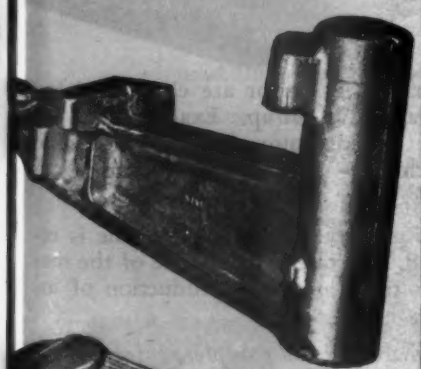
MARVEL SAWS

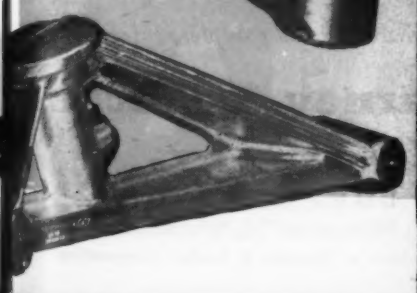
H. P. M. All-Hydraulic FORGING PRESSES ARE NOT LIMITED TO THE PRODUCTION OF SMALL, SIMPLE SHAPES

© H-P-M Co.









Press forgings are no longer limited to small, symetrical shapes. H-P-M "All-Hydraulic" forging presses are built in many sizes, with speeds and pressure capacities to meet practically every forging requirement. H-P-M self-contained forging presses with capacities up to 5000 tons are now in operation, and still more powerful units are available.

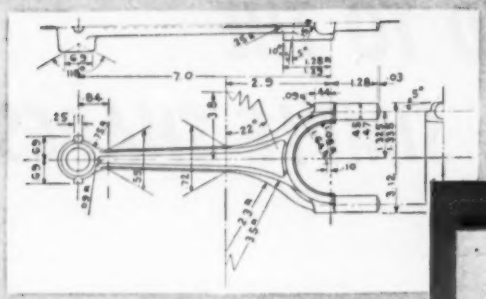
The H-P-M "All-Hydraulic" press produces a steady squeeze pressure which forges the metal as it flows into the die cavities. Impact stresses are negligible. The structure, grain flow and strength of H-P-M press forgings compare equally with those produced by impact forging machines.

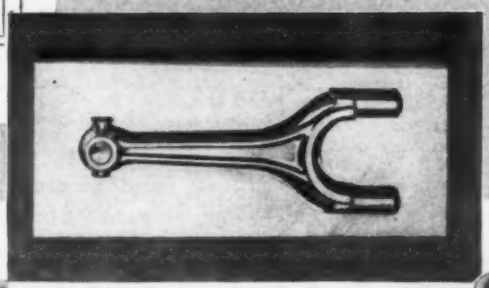
Investigate the outstanding advantages of H-P-M self-contained hydraulic forging presses. They are extremely versatile and cost less to install, operate and maintain. Write today for Bulletin 4407.

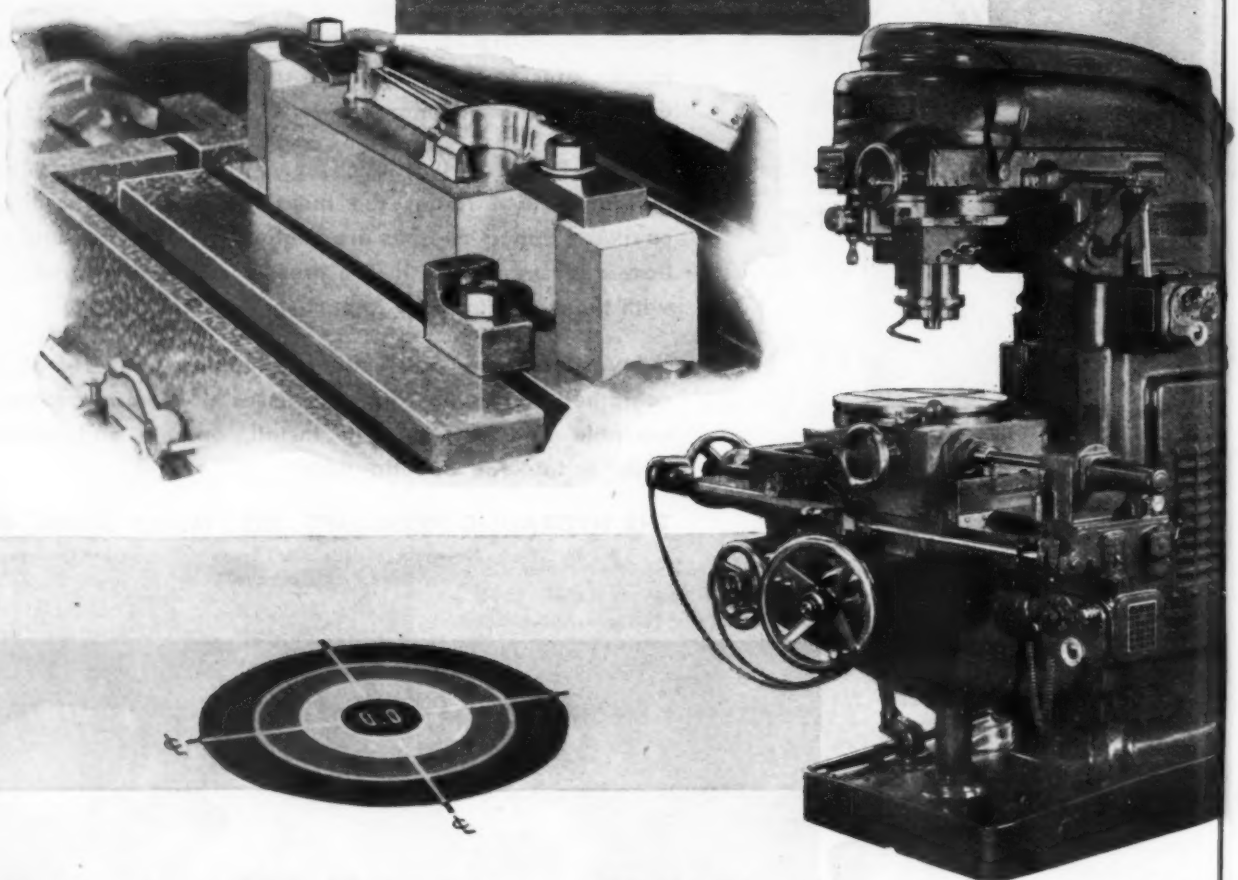
THE HYDRAULIC PRESS MFG. CO., Mount Gilead, Ohio

Branch Offices: New York, Philadelphia, Cleveland, Detroit, and Chicago.
Representatives in principal cities.

How Many Hours Would You Need to Mill this Master Hob







Speed, economy and accuracy are typical performance features of a Milwaukee Rotary Head Milling Machine. The milling operation on this master hob is an excellent example. *Read this job report* —

MASTER HOB—MATERIAL—High Carbon—High Chrome Steel. TIME DISTRIBUTION—Set-up, ¾; Layout, 1¼; Rough Mill Complete, 10; Finish Mill Complete, 29. A total time of 41 hours.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C and complete information.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTER SCOPE.

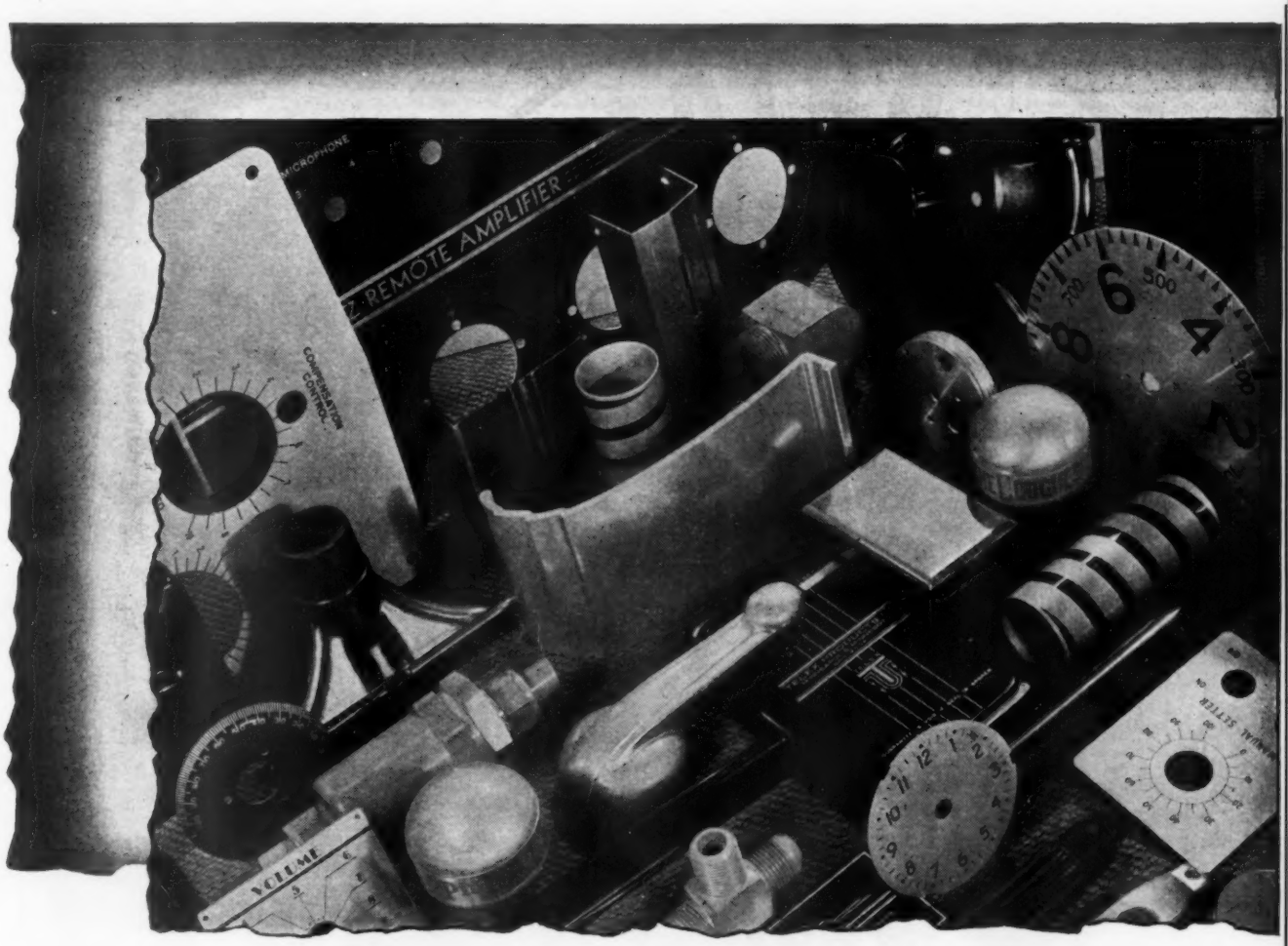
Kearney & Trecker

Products

CORPORATION

Milwaukee 14, Wisconsin

Subsidiary of Kearney & Trecker Corporation



BOOST THEIR SALES APPEAL WITH AN *Alumilite* Finish*

Your aluminum products can be given added sales appeal with an attractive, durable Alumilite finish. There are plain and colored finishes, bright and dull finishes. Used alone or in combinations, they produce striking and interesting effects.

The Alumilite process produces a dense, adherent coating of aluminum oxide, which is highly resistant to wear and corrosive attack. It adds to the usefulness and life of products. It keeps them looking young longer. Often, the Alumilite process simplifies and reduces the cost of finishing a product.

You may have the booklet, "Finishes for Aluminum", describing the many ways of finishing Alcoa Aluminum Alloys. For a copy, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Penna.

*Process patented

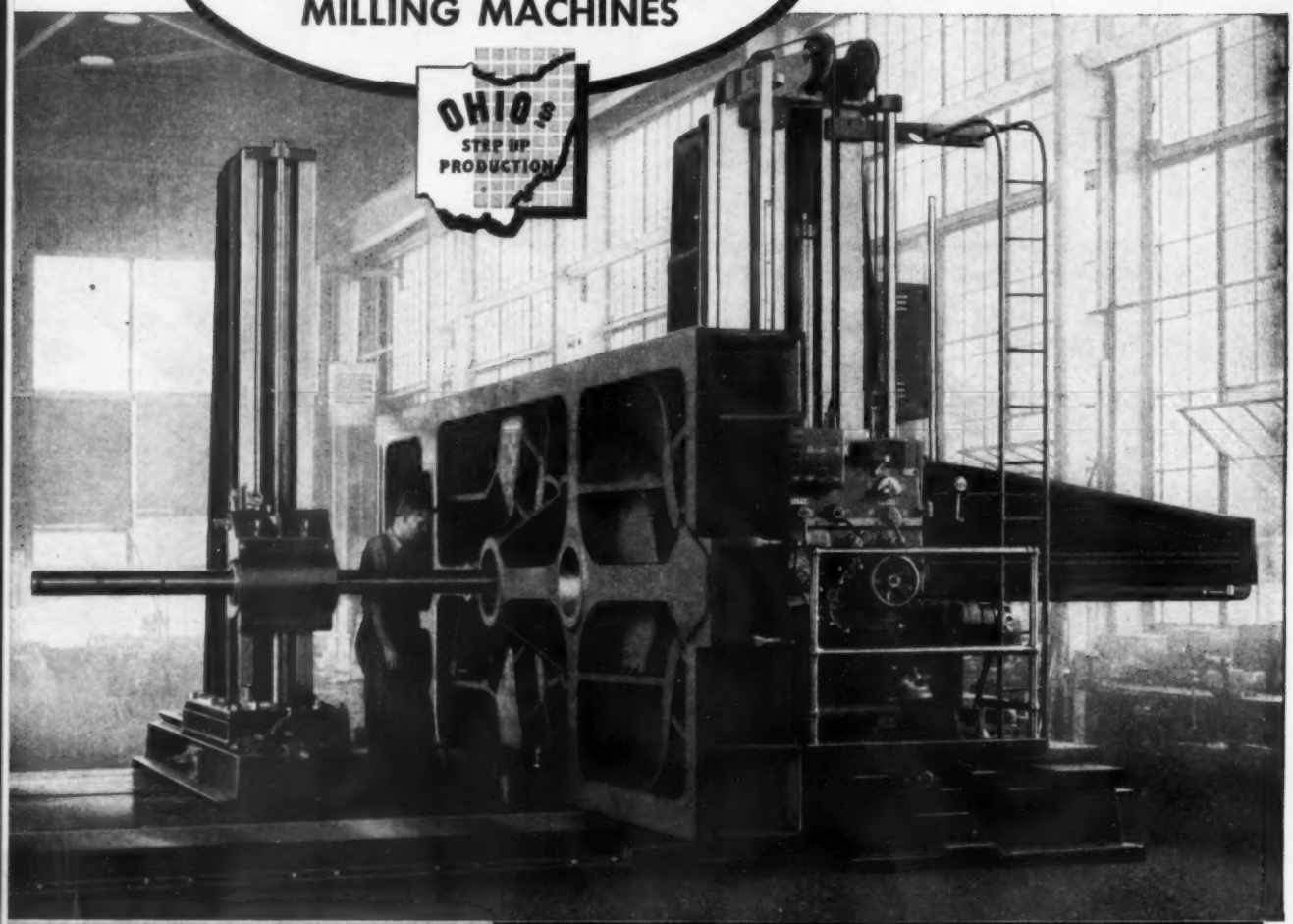
ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

ORDERS
for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES



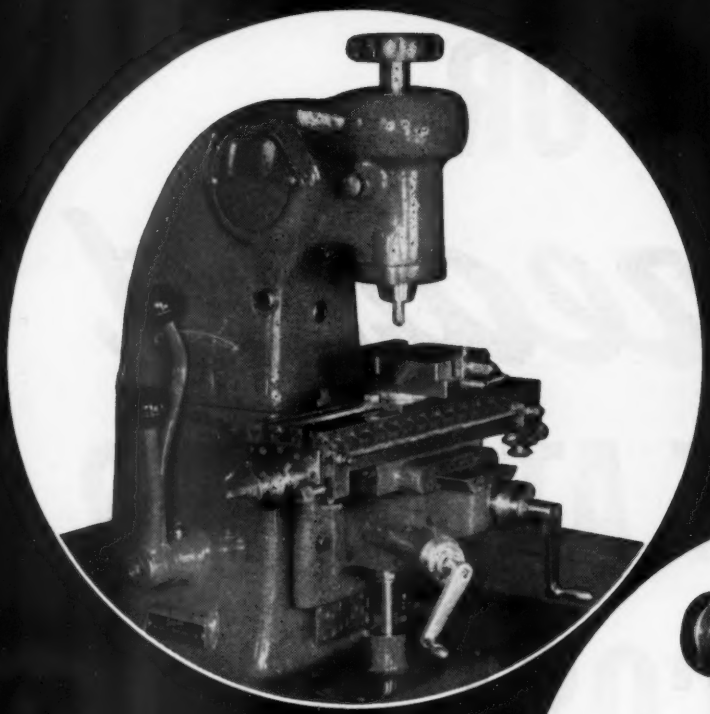
Boring, drilling, and milling operations on a 22000-pound cast steel power shovel base were handled accurately on a 6 FA Ohio Horizontal.

This country is in a big hurry. Production must mount — WITH ACCURACY. Quantity of work *with quality*, if you please. Ohio Horizontals are built for power and precision, together with safety and easy handling. Their many features today are in keeping with a record of performance which goes back to 1930, when America's first all-anti-friction boring, drilling, and milling machine appeared, bearing the name of Ohio. . . . *Get Bulletin 1000.*

THE OHIO MACHINE TOOL COMPANY
KENTON, OHIO

OHIO DREADNAUGHT

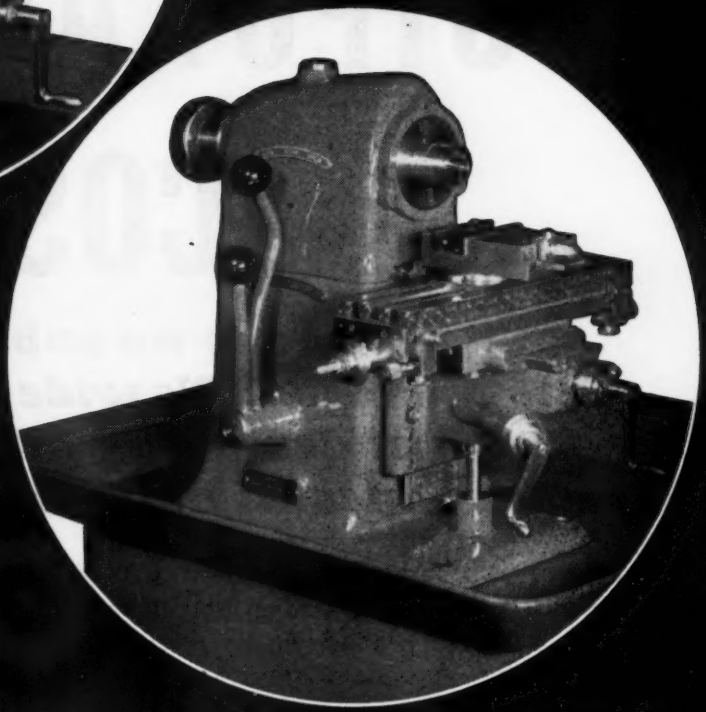
HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS



HARDINGE
ELMIRA, N.Y.

BB2V

Table: 12" x 3-3/16"
Eight Speeds: 300 to 5000 R. P. M.
Vertical Head has 1/2" Collet Capacity



BB4

Table: 12" x 3-3/16"
Eight Spindle Speeds:
180 to 3000 R. P. M.
Cutter and Index Heads
have 3/4" Collet Capacity

HARDINGE
HIGH SPEED PRECISION MILLING MACHINES

CORRECT SIZE. Closer proportion in the size of a machine tool t the size of the work means greater economy in the original inves ment and in the cost of the parts produced.

These HARDINGE Precision Milling Machines are small, compa machines designed to do a volume job on small parts, thus releasin large equipment that is too cumbersome for small work in produ tion, tool room or development departments.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

FOR *Increased* OUTPUT AT LOWER COST

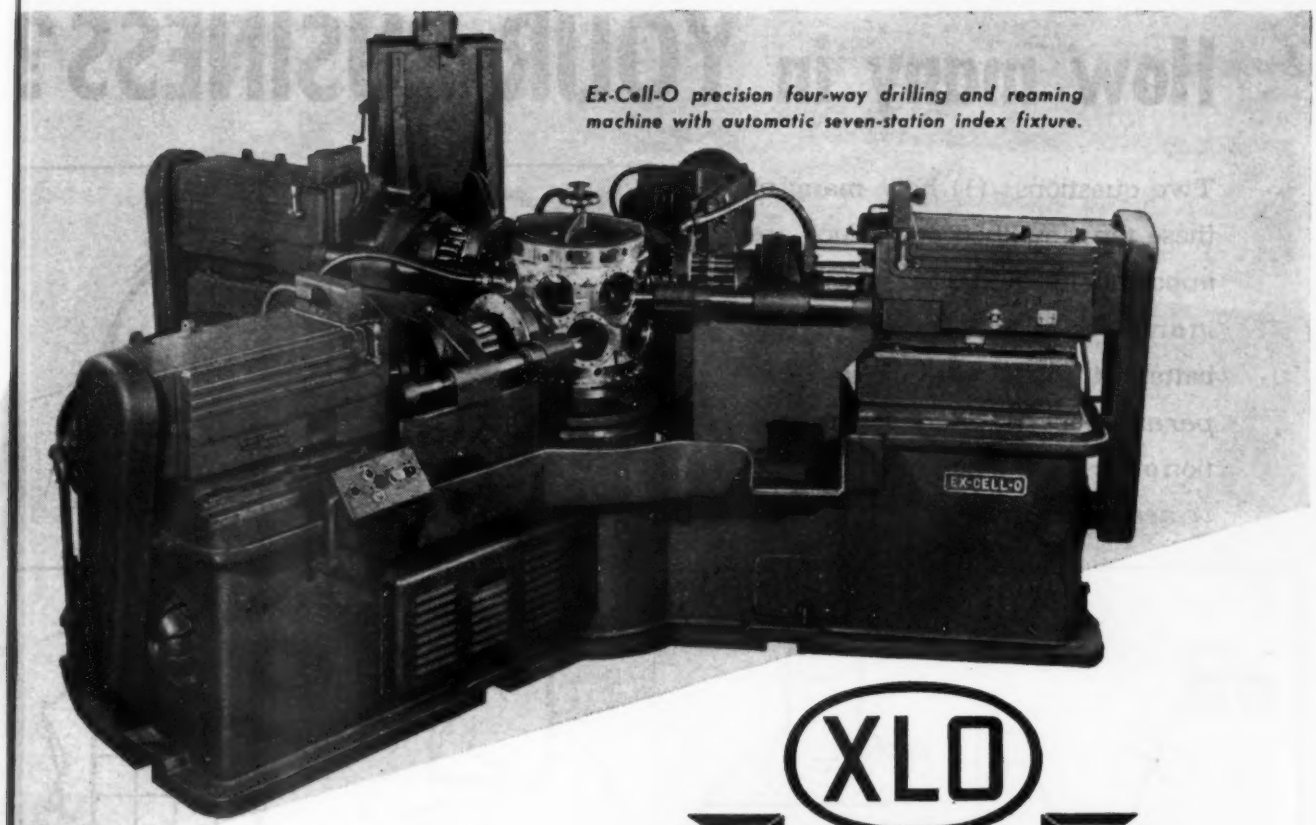
There is no substitute for Ex-Cell-O's wide experience in designing and building special machines

You have a substantial background of experience to draw from when you bring to Ex-Cell-O your problem in the *precision* machining of metal parts on a high production basis. The more economical production of accurate metal parts necessitates single-purpose machines of improved efficiency, capable of giving greater output and reducing unit cost. For years Ex-Cell-O has been an acknowledged leader in the field of special-purpose machines . . . *precision* machines with exclusive features that represent the utmost in accuracy, production, operating ease, rigidity, and durability. Every special machine manufactured by Ex-Cell-O is designed to give the most practical results on the job for which it is built—improvement in work quality, direct savings in both time and money, and maximum service and life in the machine itself.

This is why you should utilize Ex-Cell-O's experienced engineering and manufacturing facilities. Ex-Cell-O has representatives in all of the nation's principal manufacturing centers. Consult the one nearest you, or write to Ex-Cell-O Head Office in Detroit.

EX-CELL-O CORPORATION • DETROIT 6, MICHIGAN

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH SHARPENING MACHINES • HYDRAULIC POWER UNITS



Ex-Cell-O precision four-way drilling and reaming machine with automatic seven-station index fixture.

XLO

EX-CELL-O *for* PRECISION

On the above Ex-Cell-O special-purpose machine, aircraft crankcase sub-assembly of aluminum alloy is *precision* machined automatically except for loading and unloading. Part is loaded from top over center post to assure rigidity. "Start Cycle" button is pressed, and machine drills, reams, spot-faces and chamfers 16 stud holes in each of 14 deck pads (total of 224 holes, two operations per hole), then stops, ready for operator to unload and repeat the cycle. This part was formerly machined one bank at a time. Now, with this Ex-Cell-O machine, handling and operation time is exactly one-half what it was; error between banks of holes, radially and vertically (due to re-loading of part), is eliminated; finish is excellent. Also, because one machine only is now being required to do the job, considerably less floor space is needed.

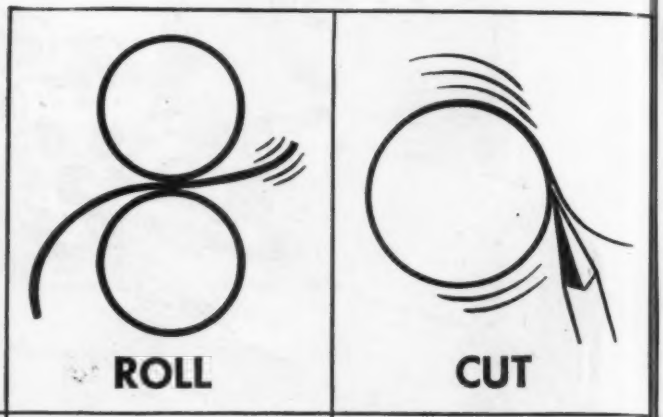
Left: Increased production attained in precision machining of this aircraft crankcase on Ex-Cell-O special-purpose machine.

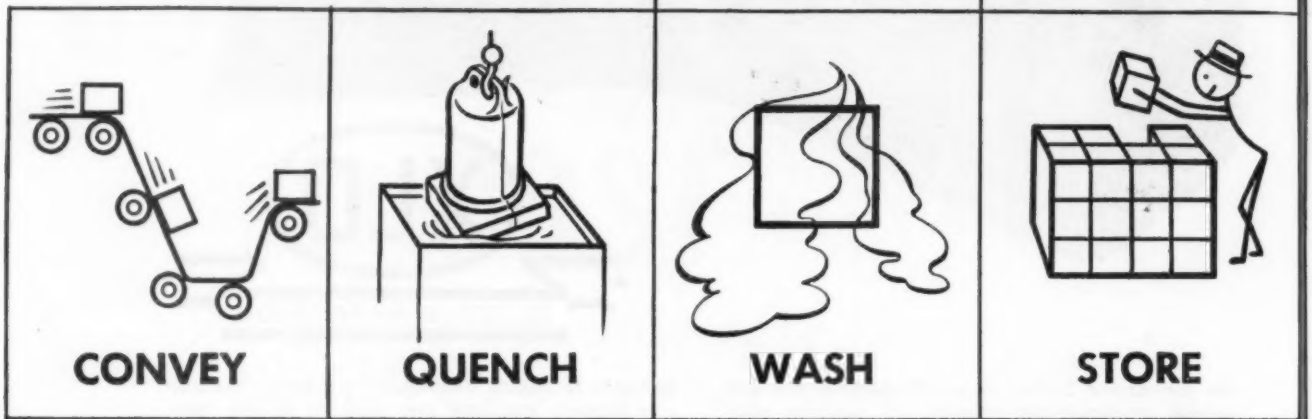
Right: If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision and speed in production, send your name, company, address and position to Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan.

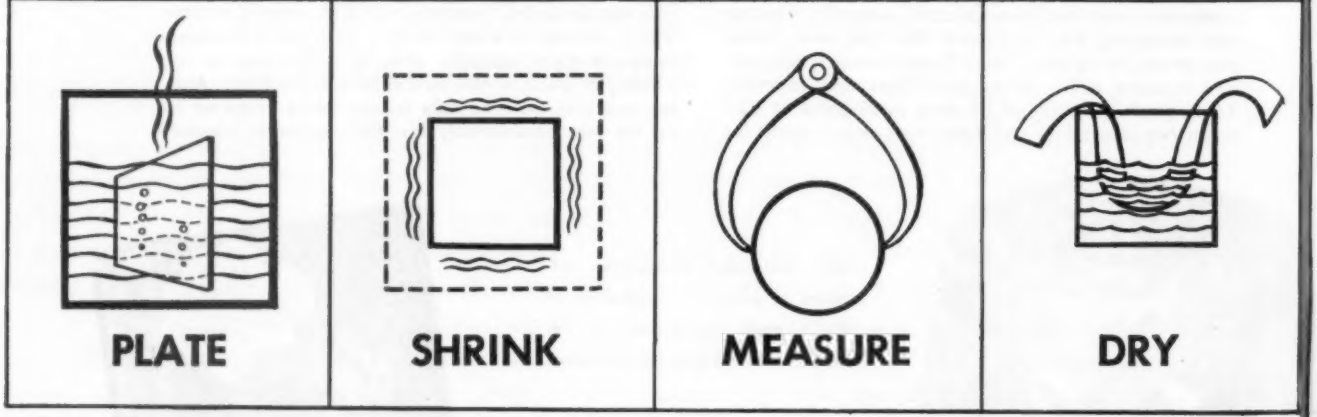
GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK PAPER MILK BOTTLE MACHINES • AIRCRAFT AND MISCELLANEOUS PRECISION PARTS

How many in YOUR BUSINESS?

Two questions: (1) how many of these ten simplified operations are important in your business? (2) how many could be handled faster, better, at lower cost—*with temperature controlled* by application of air conditioning, refrigeration or heating equipment?







If the problem involves HEATING or COOLING

. . . get the advice of General Electric *now*, by writing *General Electric Co., Air Conditioning and Commercial Refrigeration Divisions, Section 452, Bloomfield, N. J.*

☆ BUY . . . and hold . . . WAR BONDS ☆

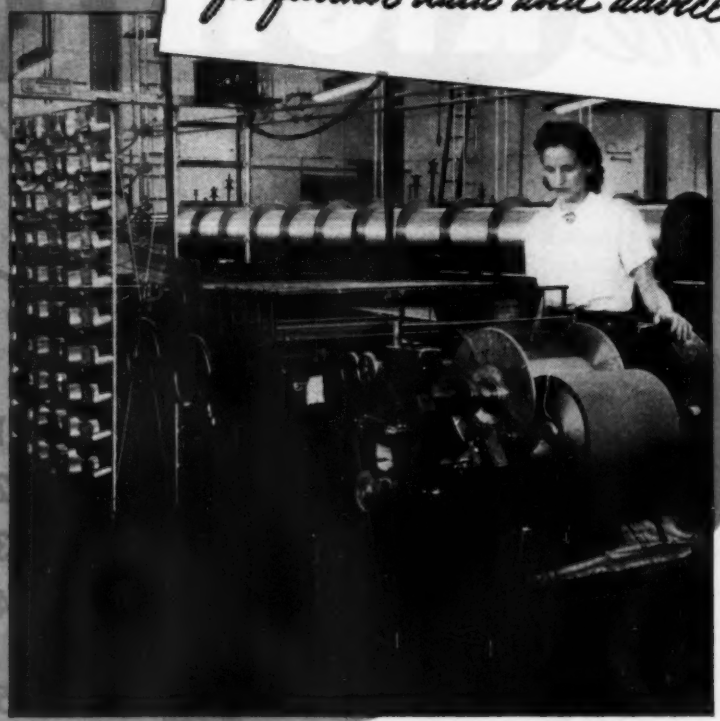
INDUSTRIAL REFRIGERATION
AND AIR CONDITIONING

GENERAL ELECTRIC

Tune in: "The G-E HOUSE PARTY," every afternoon Monday through Friday, 4 p. m. E W T, C B S . . . "The G-E ALL-GIRL ORCHESTRA," Sundays 10 p. m., E W T, N B C . . . "THE WORLD TODAY," News, Monday through Friday, 6:45 p. m., E W T, C B S

Call American Magnesium for further data and advice

Magnesium Warp Beams crowd more work into an hour



Mazlo Magnesium warp beams are time-savers. Their extremely low weight speeds up the warping operation by permitting faster starts and stops. Their permanent dimensional accuracy reduces vibration and results in better warps. Because of the high strength and stiffness of Mazlo Magnesium warp beams, they are able to withstand the tremendous forces exerted by modern yarns.

a liftable idea!

Products going into the home have greater sales appeal if they're made lighter with magnesium. Magnesium in tools and equipment makes manual tasks less fatiguing. Lighter weight parts permit machines to be run at higher speeds. You get more production, costs are lower, products of higher quality.

May we help you incorporate magnesium in your products? For this help, write Aluminum Company of America, Sales Agent for Mazlo Magnesium products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

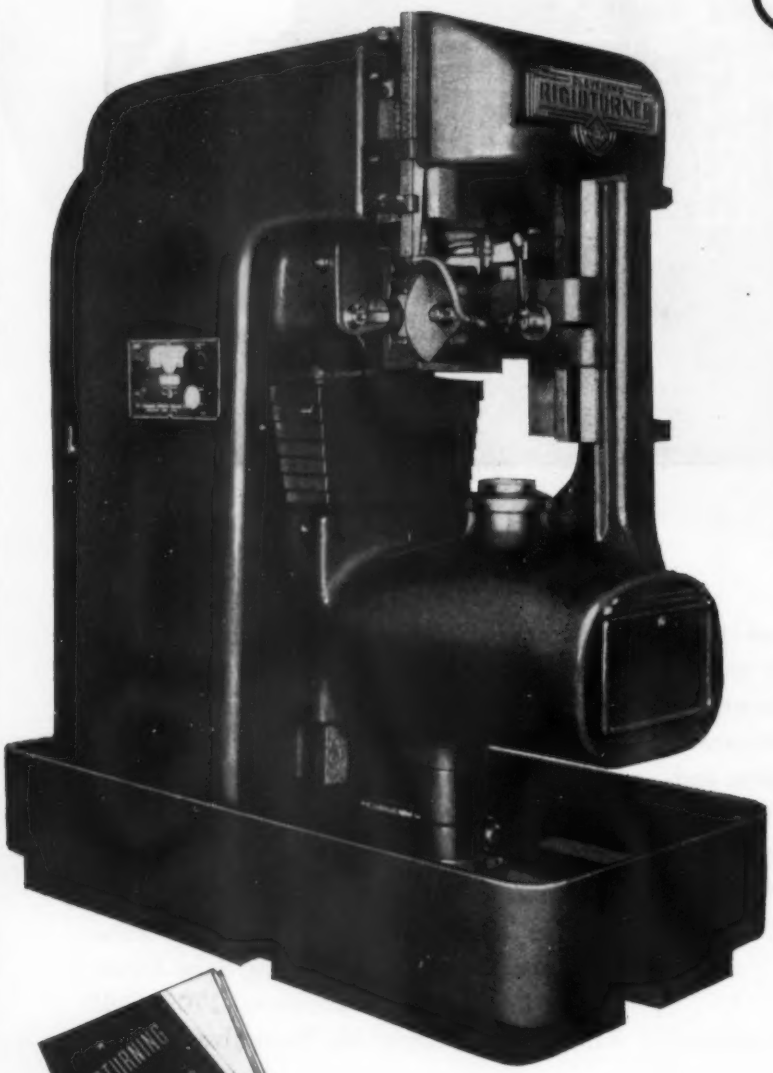
MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

Check these advantages on your multiple diameter turning jobs

The RIGIDTURNER Offers



1 More operating minutes per hour

2 Less down time

3 Quick change over

4 Will cut square corners up to 7/8" depth

5 Faithful duplication on mass production

6 Requires no specially skilled help

7 Saves floor space

In short the Rigidturner provides a distinctly different, proved method of turning multiple diameters accurately, either in quantity or small lots, at costs that are surprisingly low.

Consult a Cleveland Hobbing Engineer on your multiple diameter turning. The Rigidturner booklet tells how this machine works—what work it will handle—how it maintains tolerances and how it increases production—write for it.

THIS BULLETIN tells how the Rigidturner operates—what work it will handle and how it can save you time and costs on turning multiple diameter work. Write for yours today.

The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

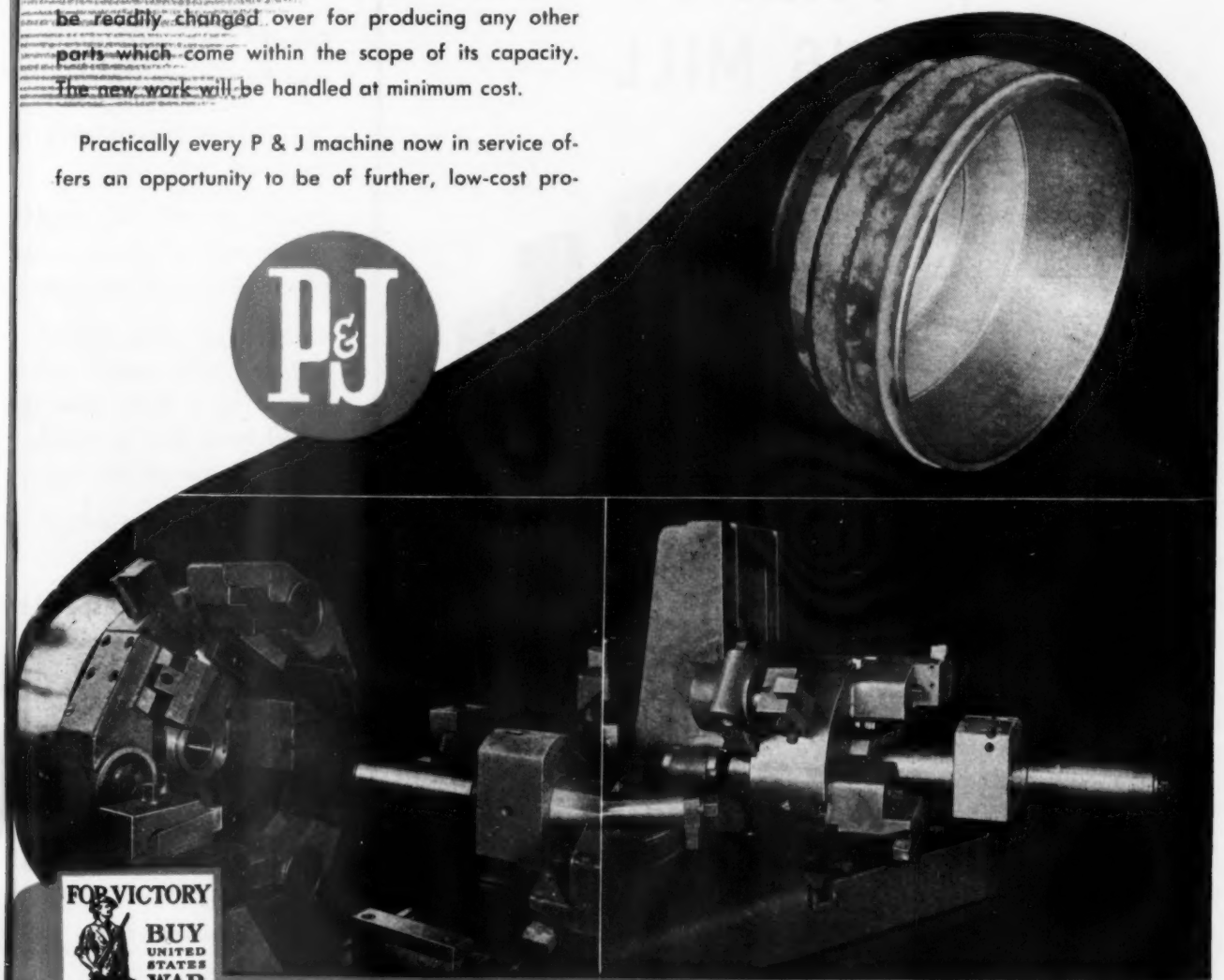
Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

P&J EQUIPMENT CAN BE RE-TOOLED . . . FOR FURTHER LOW-COST PRODUCTION

The need for cost-cutting in the era which lies ahead can be met with existing P & J equipment, because P & J design is such as to facilitate re-tooling. Thus a P & J machine, such as the 6 DRELX shown here tooled for machining brake drums, can be readily changed over for producing any other parts which come within the scope of its capacity. The new work will be handled at minimum cost.

Practically every P & J machine now in service offers an opportunity to be of further, low-cost productive use. Now is the time to consider the part your P & J equipment can play *profitably* in your reconversion program. P & J engineers are at your command to help you re-tool to greatest advantage.



FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

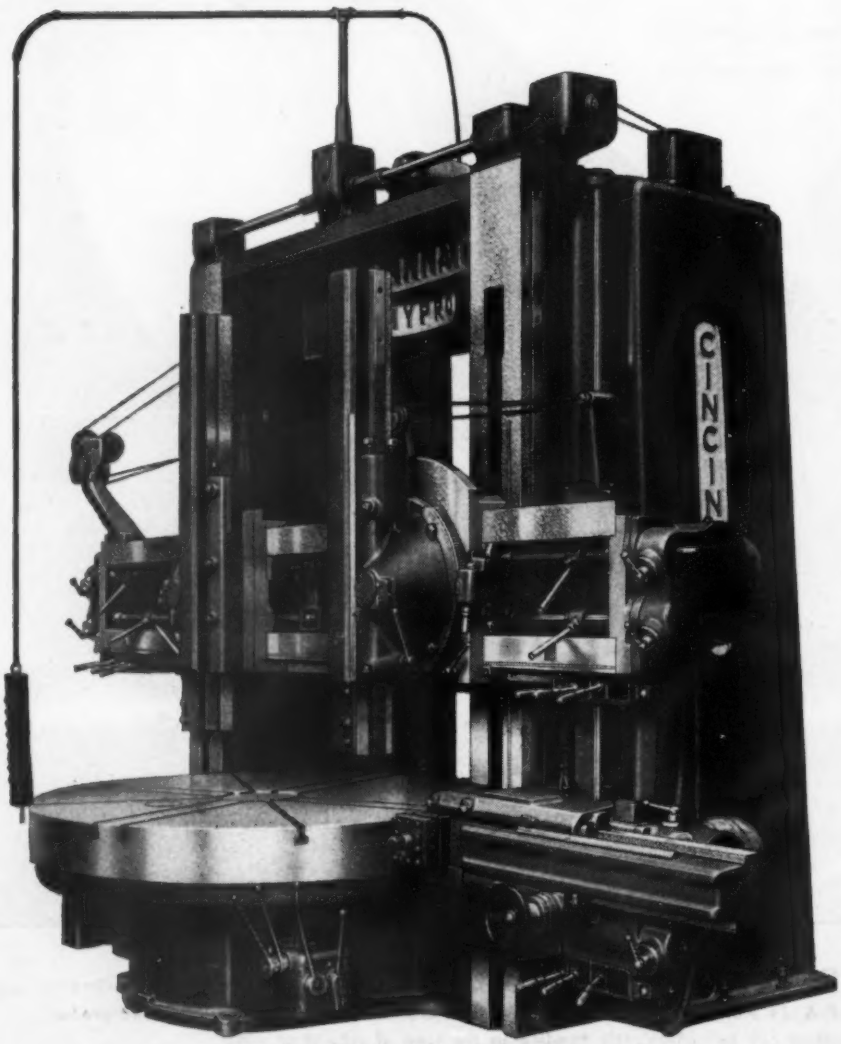
"U. S." Stands for "UNCONDITIONAL SURRENDER" Buy More BONDS

P & J REBUILDING SERVICE Owners of P & J Automatics are invited to investigate P & J's plant facilities for rebuilding their machines to original accuracy and productivity. Re-tooling can be conveniently handled at the time of rebuilding.

POTTER & JOHNSTON MACHINE CO.

PAWTUCKET, R. I.

CINCINNATI HYPRO *7' Vertical* BORING MILL



Write for Bulletin 132-AM

For Capacity Versatility Accuracy

Specify Cincinnati Hypro Ver tical Boring and Turning Mill

The 7' Mill shown brings yo these advantages:

One-piece bed and speed bo reinforced with heavy radia ribs to eliminate misalignmen

Extra depth table heavily re inforced with radial ribs an driven by a wide face spir bevel gear that is nearly th full diameter of the table.

The table runs on anti-frictio bearings.

A fully Timkenized speed bo built into the one-piece bed offers 16 speeds on alternatin current or wide range, fine in crement speed adjustment wit a direct current main driv motor.

Massive pyramid type hou ings provide for rigidity und the most severe duty.

Quick acting, self-interlockin rail clamp may be operate from either end of the ext heavy rail.

THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI . OHIO . U.S.A.

SAID THE FIELD TEST REPORT

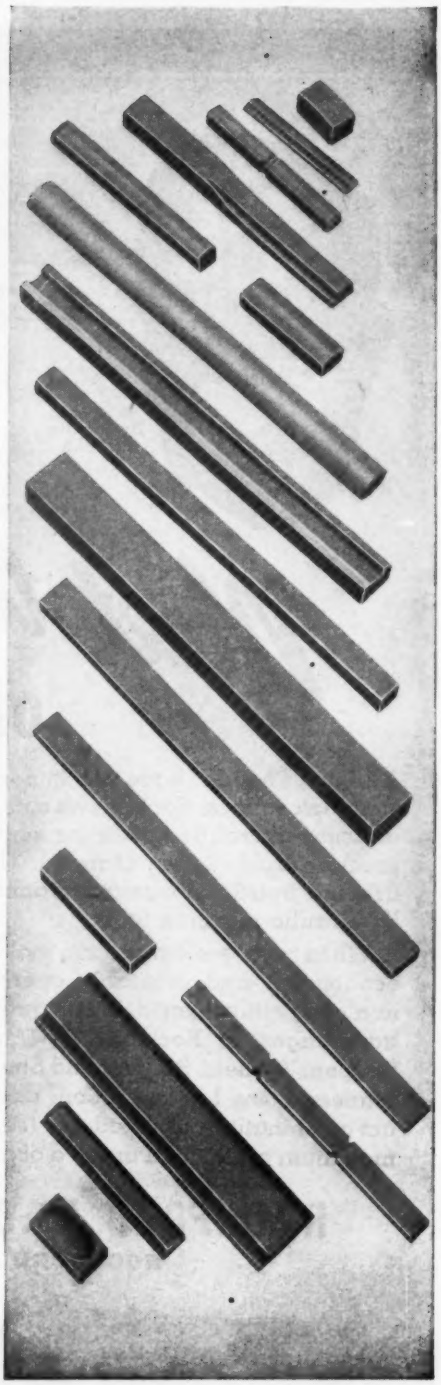
"An Outstanding Performance"

● Time after time this phrase is used by our field engineers reporting on tests of Mid-West Abrasive Company products in competition with other abrasives.

A typical report reads:

"Our 2.80 JY-11 wheel gave an outstanding performance on a test involving grinding intake and exhaust valves on airplane engines. It produced excellent finish, with rapid stock removal, minimum temperature rise, and almost THREE TIMES THE NUMBER of valves produced by competitive wheel."

Let one of our staff of highly-trained field engineers make a study of your abrasive problem. You'll find there's a Mid-West item to fill every need. Prompt delivery on grinding wheels, honing stones, sandpaper, rubbing bricks, sharpening stones, or any product in the Mid-West line.



MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso Mich. | 1960 E. Milwaukee Detroit 11, Mich. | Rochester Pa.

Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Michigan

Please send me your complete data book on grinding wheels.

NAME_____

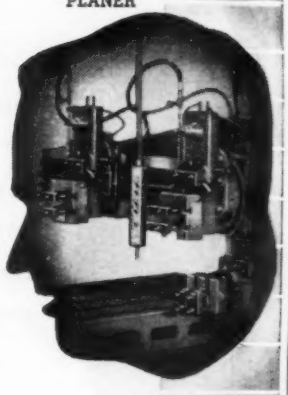
ADDRESS_____

Rockford Hy-Draulic SLOTTER

Rockford Hy-Draulic SHAPER

Rockford Hy-Draulic OPENSIDE SHAPER

Meet the "Heads" of a Famous Family



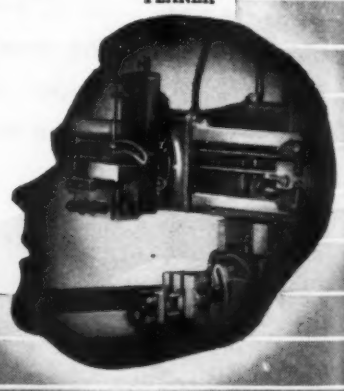
Rockford Hy-Draulic OPENSIDE PLANER

All these "heads" have one important factor in common. Each shows a means of using hydraulic power for smooth, precise, rapid cutting of metal. These are the heads of various Rockford Hy-Draulic machine tools.

When you seek machine tools for economical and profitable operation in a competitive world, investigate the advantages of Rockford Hy-Draulic Shapers, Planers, Slotters and Shaper-Planers. Easy, fast operation; and exact combinations of speed and feed for maximum production are two of many features in Hy-Draulic design which cut costs and increase production.

Bulletins are available describing the following Rockford Hy-Draulic machine tools: Shaper—12" stroke; Shapers—16" to 28" stroke; Openside Shaper—36" stroke; Planers, Openside and Double Housing, up to 60" x 60" and 20-foot stroke; Slotters—12", 20", or 36" stroke; Shaper-Planers 42" to 144" stroke.

Copies of any and all bulletins will be sent without charge or obligation. Please address Dept. 1119.

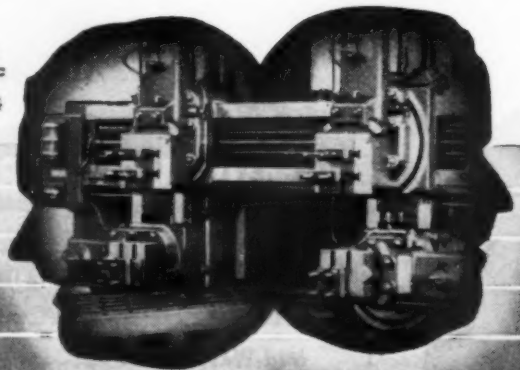


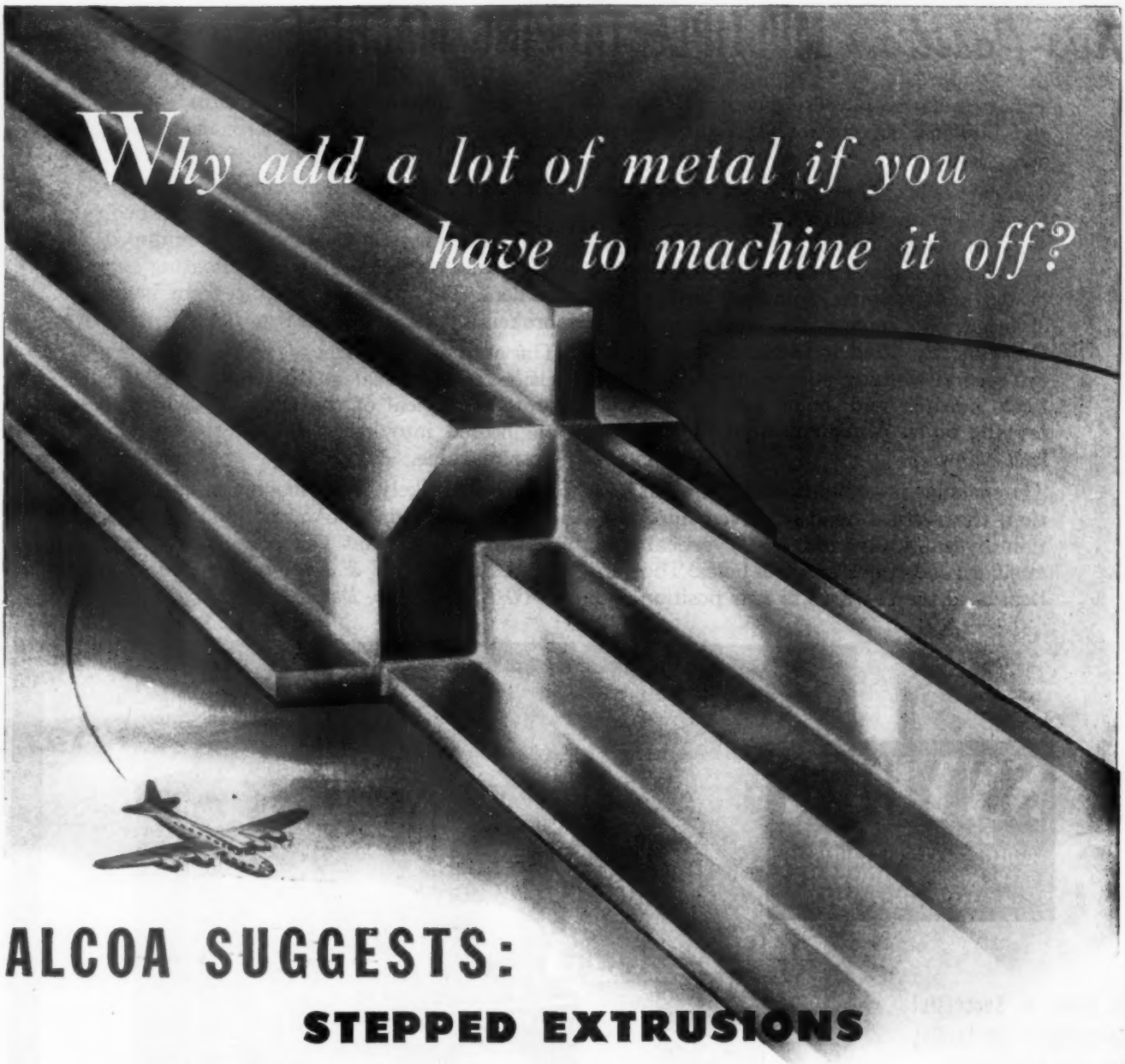
Rockford Hy-Draulic SHAPER PLANER

ROCKFORD MACHINE TOOL COMPANY

ROCKFORD ILLINOIS

Rockford Hy-Draulic DOUBLE HOUSING PLANER





ALCOA SUGGESTS:

STEPPED EXTRUSIONS

Airplane wing spar caps call for tapers consistent with strength requirements. Reducing straight sections to a taper requires expensive, time-consuming machining. Alcoa's stepped extrusions can be used to reduce the amount of metal to be removed to produce a taper. Production is speeded up, costs reduced.

Stepped extrusions can provide a larger, integral section from which the attachment fitting is cut out. This avoids the extra weight and cost of a splice.

Will stepped extrusions fit your production? Each case must be analyzed individually from a design and an economic standpoint. Alcoa engineers will gladly give you the benefit of their experience to determine the facts. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

Two-Position MULTIPLE TAPPING MACHINE *by Snyder*

This is a special-purpose machine designed and built by Snyder for multiple tapping operations on a large aircraft part.

The part is loaded and clamped in a fixture on a hydraulic sliding table. In the first working station there are vertical and angular tapping units equipped with multiple heads and tapping spindles having individual lead screws. The vertical unit is hydraulically lifted to facilitate loading. In the second working station, there are vertical multiple and single spindle angular tapping units. All spindles have individual lead screws.

The machine is semi-automatic. In first station, the vertical head is moved into position hydraulically and both vertical and angular heads tap a series of holes. The vertical head then returns to rear position and the part automatically moves to second station, and vertical and horizontal heads go through the tapping cycle.

Fixture and slide then automatically return to loading station and the part is finished. All lead screw tapping spindles are equipped with safety spindle ends and floating tap holders. This protects the tap from being broken and the work piece from being spoiled.

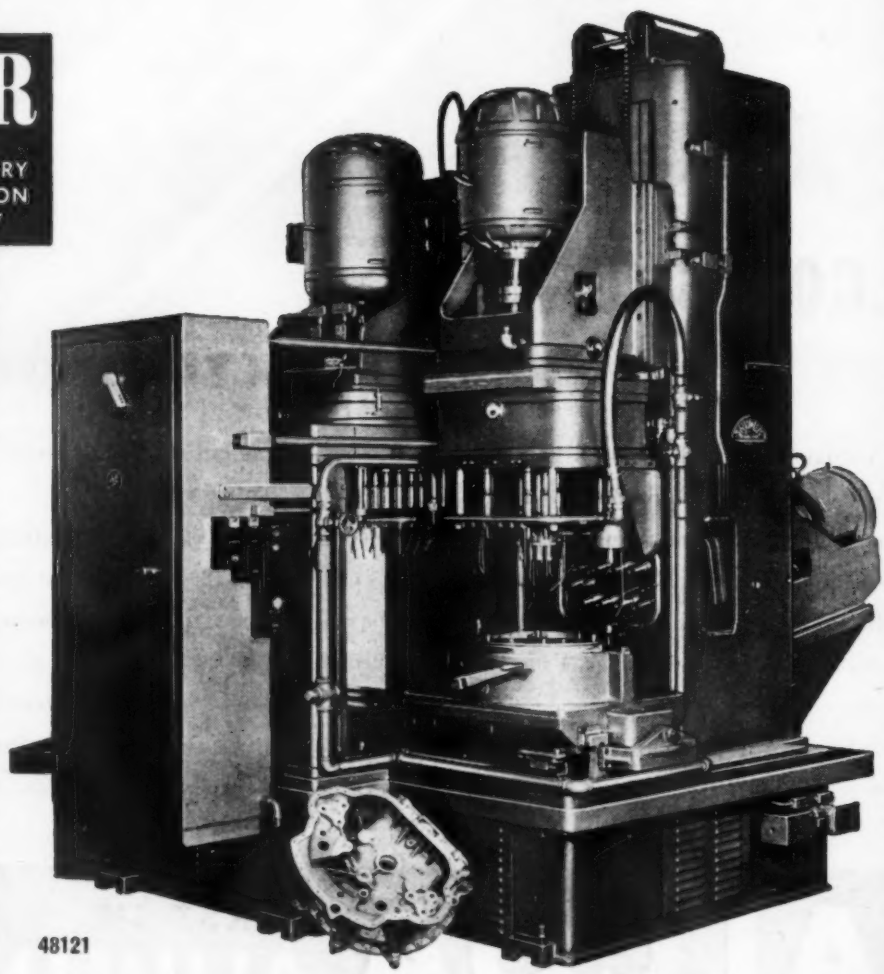
The automatic control of quality and precision and the safeguards built into this unit are typical of the efficiency which is engineered into every Snyder special-purpose machine.

More than likely, such machines figure importantly in your post-war production plans, which suggests that you consult Snyder—now. *Snyder Tool & Engineering Company, 3400 E. Lafayette, Detroit 7, Michigan.*

SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries.



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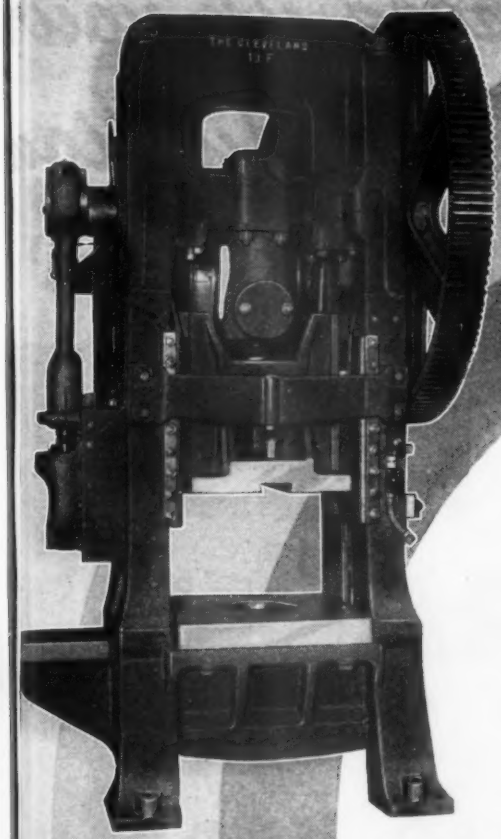
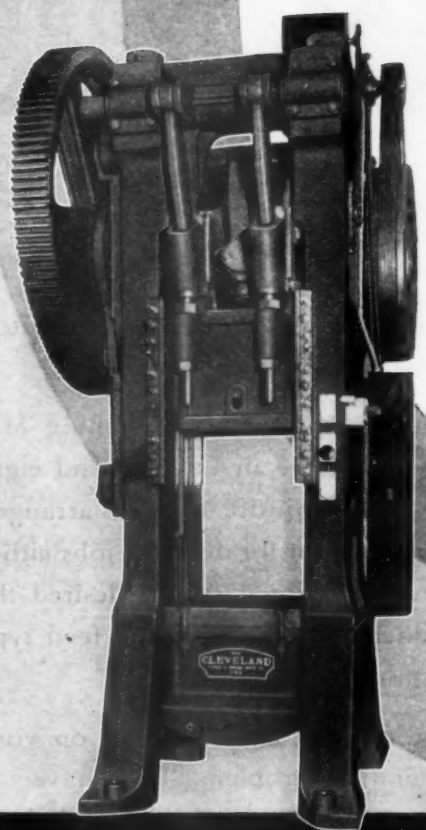


CLEVELAND
SINGLE CRANK PRESSES
Equipped with
ELECTRICALLY CONTROLLED FRICTION CLUTCHES

These three illustrations show some of the smaller sizes of Cleveland Trimming, Double Action Toggle and Straight Sided Presses equipped with electrically controlled friction clutches and brakes, which can be used for inching, long and short stroke or continuous operation of the slide.

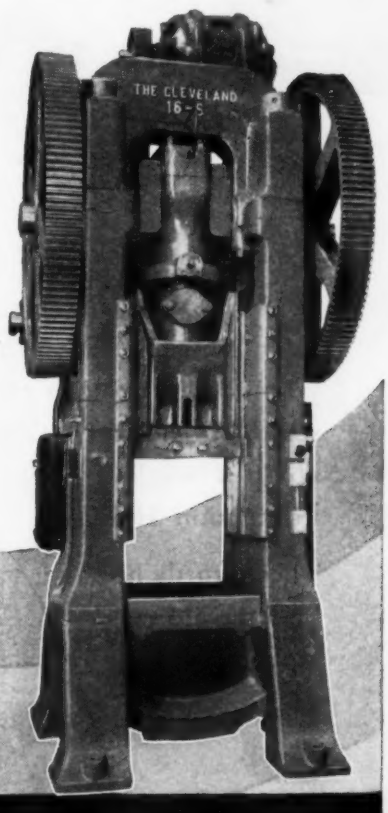
As will be noted, this design contributes to a more compact machine, without overhanging brackets, saves valuable overall floor space and assures greater ruggedness and accuracy.

The Presses illustrated can be furnished in sizes and capacities to suit requirements and with manually operated jaw clutches or electrically controlled pneumatic or hydraulic friction clutches.

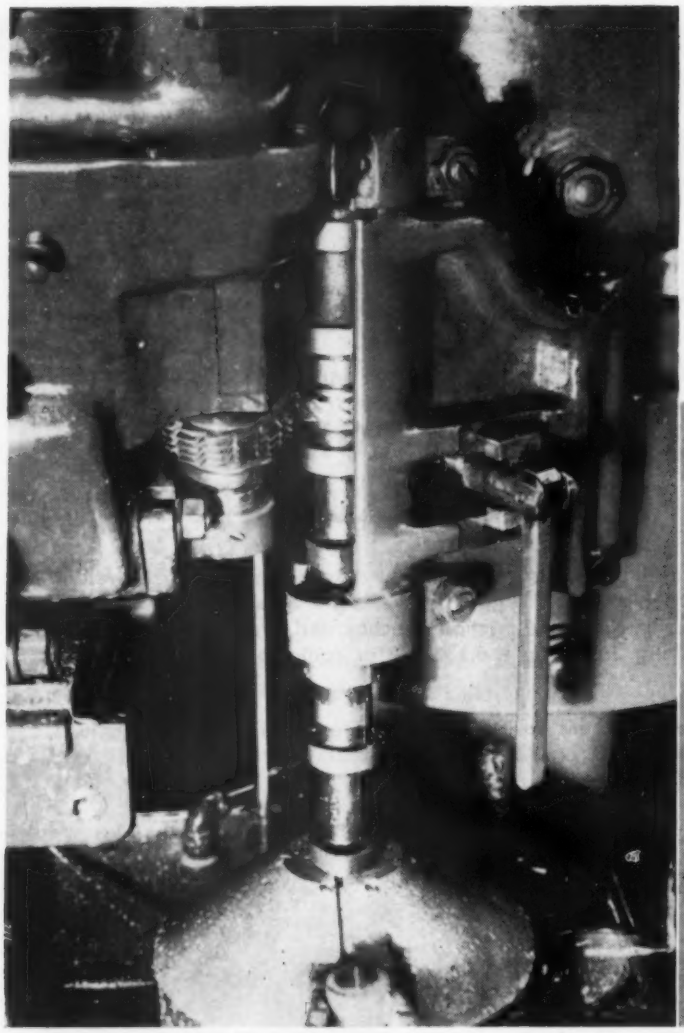


Other Types of Cleveland Presses Include

- Inclinable
- Horning
- Punch Type
- Open Back Gap
- Knuckle Joint
- Straight Sided Double Crank
- Double Crank, Double Action Toggle
- Single Point Two Point and Four Point



THE CLEVELAND PUNCH & SHEAR WORKS CO.
CLEVELAND, OHIO



Close up of gear in center of an automobile camshaft, hobbed on Lees-Bradner Rotary Hobbing Machine arranged with automatic Hob in-feed mechanism in the plant of a prominent automobile manufacturer.

Speed up your production

LEES-BRADNER *Rotary* GEAR HOBBER

● As you look ahead anticipating high production hobbing equipment you can speed up the generation of spur and helical gears—sprockets and splines with a Lees-Bradner Rotary Production Hobber.

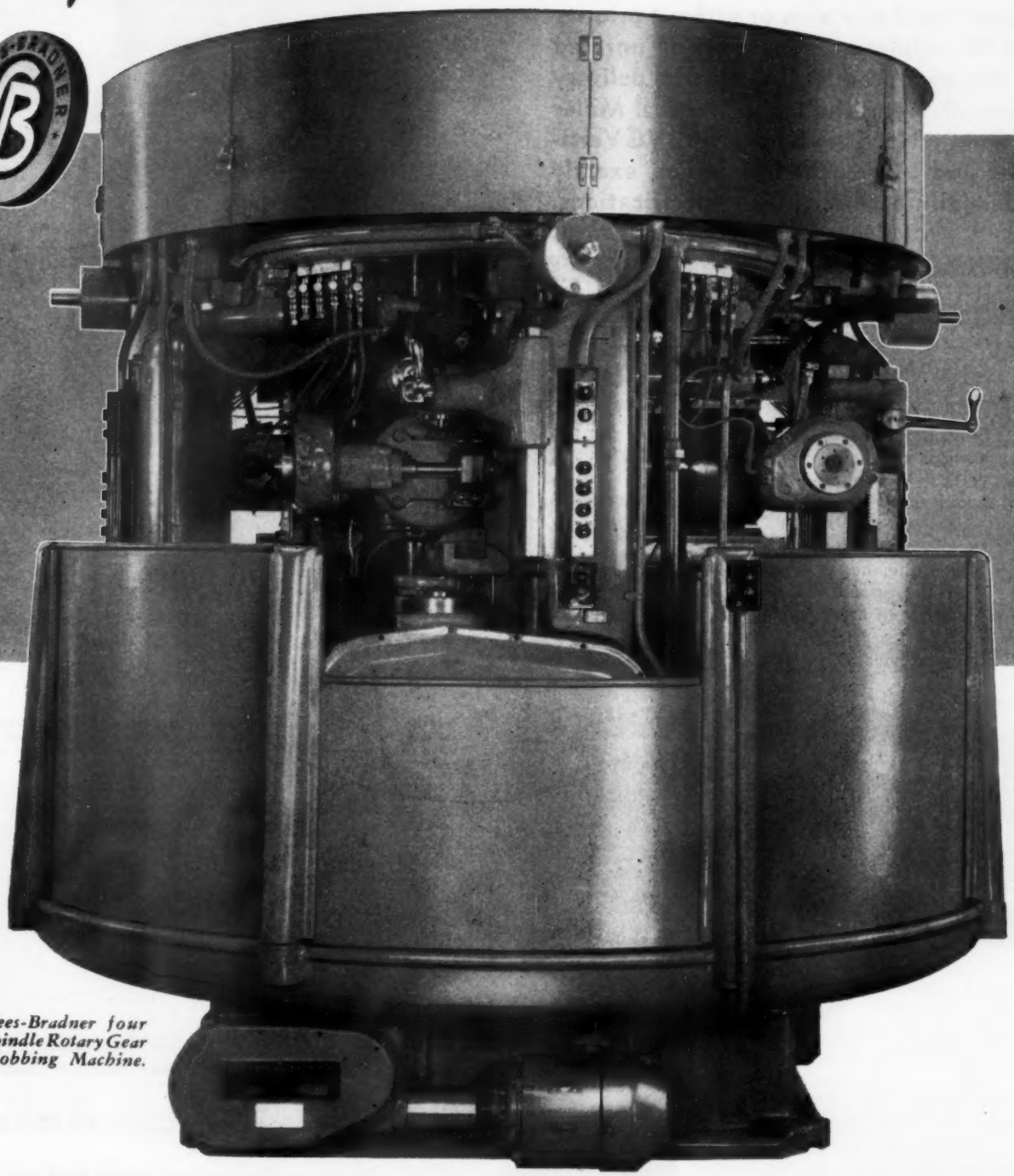
These sturdy hobbing machines originated and developed by Lees-Bradner are unequalled for large scale gear production.

They are extremely simple to operate and eliminate the need for highly skilled operators due to the practically automatic functioning of the machine—operator merely inserts the work—presses a button and the machine completes the job.

Lees-Bradner Rotary Gear Hobbing Machines are available in four-six and eight spindles. Each spindle may be arranged for the same job or for different jobs either climb or conventional cut. If desired the Lees-Bradner automatic plunge feed type mechanism can be supplied.

Why not consult Lees-Bradner on your gear generation problem. They have the experience—the organization—and flexibility in equipment to help you.

...urmass gear production with high ...oneequipment...



Lees-Bradner four spindle Rotary Gear Hobbing Machine.

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

For IMMEDIATE DELIVERY . . . . .

Here are four famous Reed-Prentice Millers, with only a few of each model available, which may be purchased now with or without priority under WPB regulations on rated or unrated orders. We can promise immediate delivery on any one of them, the No. 5 Vertical Miller and Die Sinker, No. 5 Jig Borer, No. 3VG Vertical Miller and No. 4 Vertical Miller, exactly as listed in the accompanying specifications.

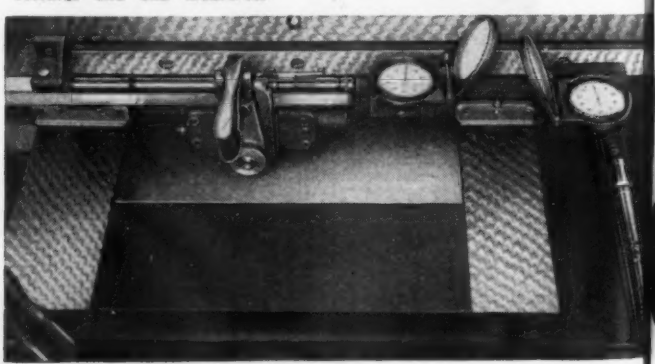
REED-PRENTICE No. 5 Vertical Miller and Die Sinker

SPECIFICATIONS

Longitudinal power feed 48"
Cross power feed 16"
Vertical adjustment head on column 15"
Vertical feed of spindle 9"
Rapid power traverse in either direction, longitudinal per minute 100", cross 100"
Table working surface 68" x 16"
Spindle: number of speeds 18, standard range spindle speeds, min. and max. RPM 17-600, number of feeds for each spindle speed 8, feed range for 18 speeds .002 to .297
Shipping weight 11,500 lbs.

REED-PRENTICE No. 5 Jig Borer

Close-up showing longitudinal and cross table indicating devices including dial indicators for accurate measurements to one-tenth of one-thousandth two differential micrometer heads, one for longitudinal and one for cross settings and end measures.



SPECIFICATIONS

Longitudinal power feed 48"
Cross power feed 16"
Vertical adjustment head on column 15"
Vertical feed of spindle 9"
Rapid power traverse in either direction, longitudinal per minute 100", cross 100"
Table working surface 68" x 16"
Spindle: number of speeds 18, standard range spindle speeds, Helical Gear Drive, RPM 17-600, number of feeds for each spindle speed 8, feed range for 18 speeds .002 to .297
Shipping weight 11,500 lbs.

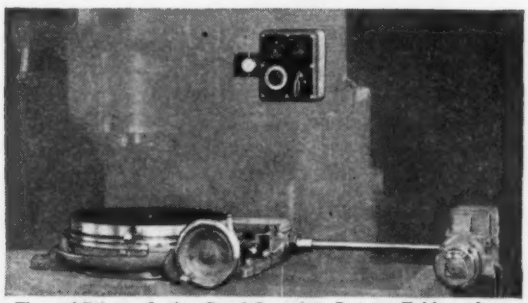
WITH OR WITHOUT PRIORITY

REED-PRENTICE No. 3VG Vertical Miller and Die Sinker

SPECIFICATIONS

Longitudinal feed (power) 24"
Cross feed 12"
Vertical adjustment of knee 18"
Vertical adjustment head on column 5"
Rotary table, working surface 16½"
Machine table, working surface 10¼" x 36"
Range of spindle speeds from min. of 300 to max. of 4000 RPM according to type of motor
Shipping weight machine without rotary table, with motor 2850 lbs.

REED-PRENTICE No. 4 Vertical Miller



The addition of the Reed-Prentice Rotary Table, whose diameter is 24" permits a vastly greater field of operation. A simplified control station regulates the power down feed controlled by electronic speed and torque regulator. This regulator provides smooth, continuous, infinitely variable feed power to the vertical head.

SPECIFICATIONS

Longitudinal travel of table 48"
Travel of cross-slide 24"
Vertical Travel of head 12"
End of spindle to table — Max 24", Min. 12"
Throat depth 33"
Top of table to under-side of ram ways 19¾"
Table working surface 24" x 84"
Number of speeds 18
Speed range 30-1200 RPM
Feeds: number infinitely variable, table and cross-slide ½"-32" per minute
Power rapid traverse to table and cross-slide 180" per minute
Net weight 20,500 lbs.

MACHINE TOOLS

REED-PRENTICE CORP.

WORCESTER MASS., U.S.A.

NEW YORK OFFICE
75 West St.
New York 6, N. Y.
CLEVELAND OFFICE
1213 W. 3rd St.
Cleveland 13, Ohio

KING

Vertical Boring and Turning Machine

● Here a King 52" Boring and Turning Machine is turning stator frames for bearing housing fit. This particular job is a steel casting.

For turning—boring—facing and similar operations King Vertical Boring and Turning Machines have the rigidity and stamina to handle a wide range of work. They have ample power to handle alloy tools on work requiring heavy cuts in steel castings.

Another advantage of this rigid construction is the precision work and smooth finish obtained.

On your precision boring—turning—and facing operations put your next job on a King for accuracy—finish—and ultimate economy.

King builds Vertical Boring and Turning Machines exclusively in single column types from 30" to 42"—double column types from 52" to 12 feet.

THE KING MACHINE TOOL COMPANY
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

Send for these RECENT SCHERR BULLETINS

. . . KEEP POSTED ON THE LATEST DEVELOPMENTS IN MEASURING.. INSPECTION *and* PRODUCTION . . .

Closer tolerances are here to stay, therefore every shop man owes it to himself to keep informed on new and improved methods and equipment which contribute to precision measuring and production.

The SCHERR BULLETINS listed here contain important, useful and valuable information in which every shop is interested. Any or all of these bulletins will be sent promptly on request. Check the ones you would like to receive on the coupon below—and

MAIL COUPON TODAY

GEORGE SCHERR CO.
200 Lafayette St., New York 13, N. Y.

Kindly send the bulletins checked below—without obligation.

- ☐ Scherr Opti-Flat Glass Surface Plate
- ☐ Spencer Metallurgical Microscope
- ☐ Spencer Binocular Microscope
- ☐ Atlantic Emergency Plug Gage Set
- ☐ Reed Micrometers
- ☐ Gibbs Automatic Screw Machine
- ☐ Precise Production (a news bulletin published by George Scherr Co.)

Name .....

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Company .....

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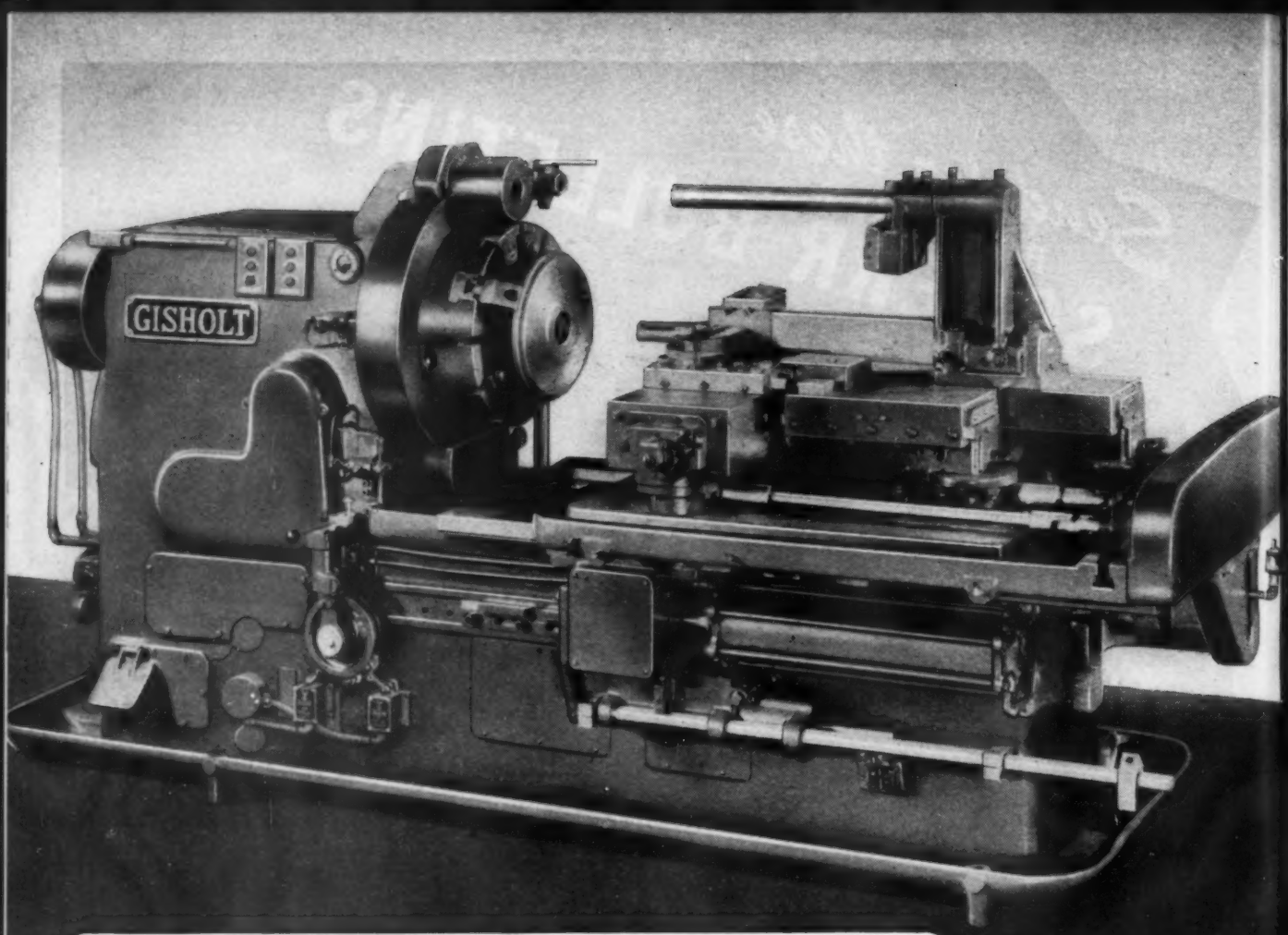
ACCURACY

GEORGE SCHERR CO.
INCORPORATED
200 LAFAYETTE STREET NEW YORK 12, N. Y.



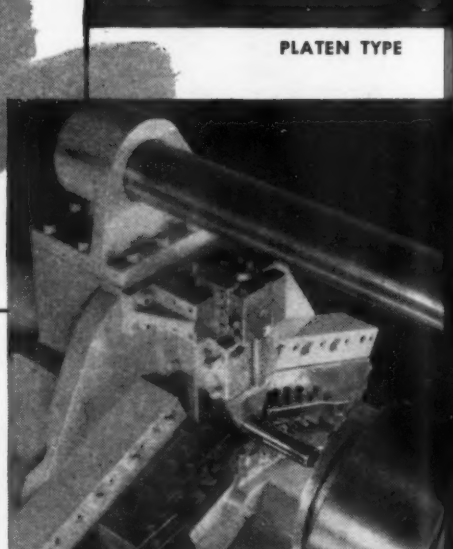
PLATEN TYPE

Simple is the word for the *Simplimatics*

Yes, wherever the run of similar parts is sufficient, the Gisholt Simplimatic can solve several of your problems at once.

1. **High-speed production assures larger output at lower cost per piece.**
2. **The wide variety of tool arrangements on the large flat table of the Platen-Type Simplimatic (shown above) makes it adaptable to a wide range of work.**
3. **Training time is reduced to a minimum because the entire machining cycle is completely automatic. One operator normally runs several Simplimatics.**

If simpler, quicker, lower-cost production is important to you now, and in the years ahead, this is a good time to investigate the Gisholt Simplimatics. Ask for literature.



RADIAL SLIDE ARRANGEMENT

THE RADIAL TYPE SIMPLIMATICS are ideal for machining fly wheels, etc., with wide faces and multiple inside and outside diameters. Extreme rigidity permits multiple tooling and maximum cutting speeds, sustained accuracy, and excellent life of cutting tools.

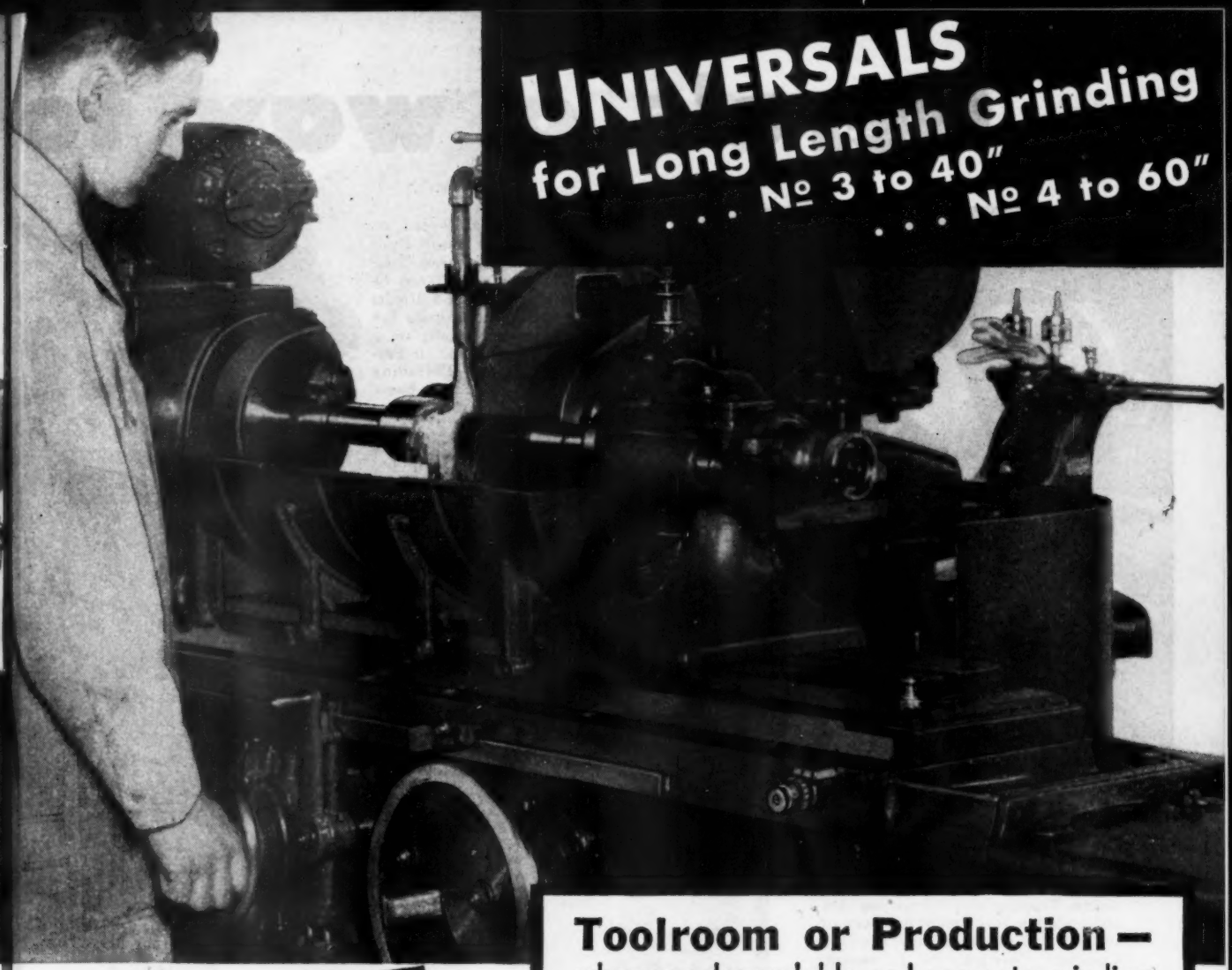
GISHOLT MACHINE COMPANY

1201 East Washington Avenue • Madison 3, Wisconsin

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



UNIVERSALS
for Long Length Grinding
. . . No 3 to 40"
. . . No 4 to 60"

Toolroom or Production — wherever dependable and accurate grinding is required – these popular machines handle work profitably.

Simple — Quick to Set Up — Easy to Operate

– use these fast producers for efficient grinding on all types of jobs –

Cylindrical
Internal
Shoulder,
Taper
Angle
Face
– and Combination
Angle and Taper
(External and Internal)

Ask for complete information on the versatile Nos. 3 and 4 Universal Grinding Machines.

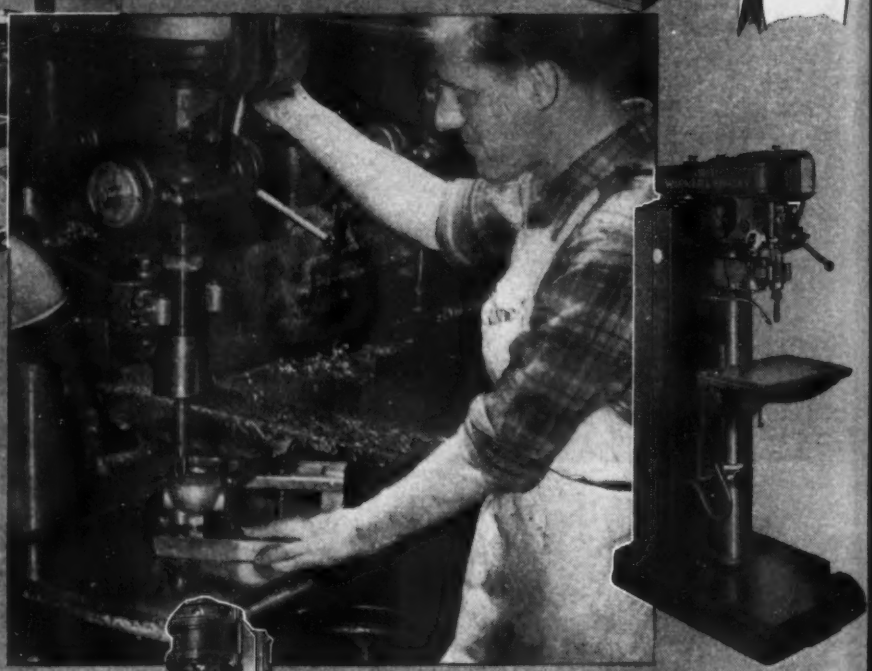
B·S

BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

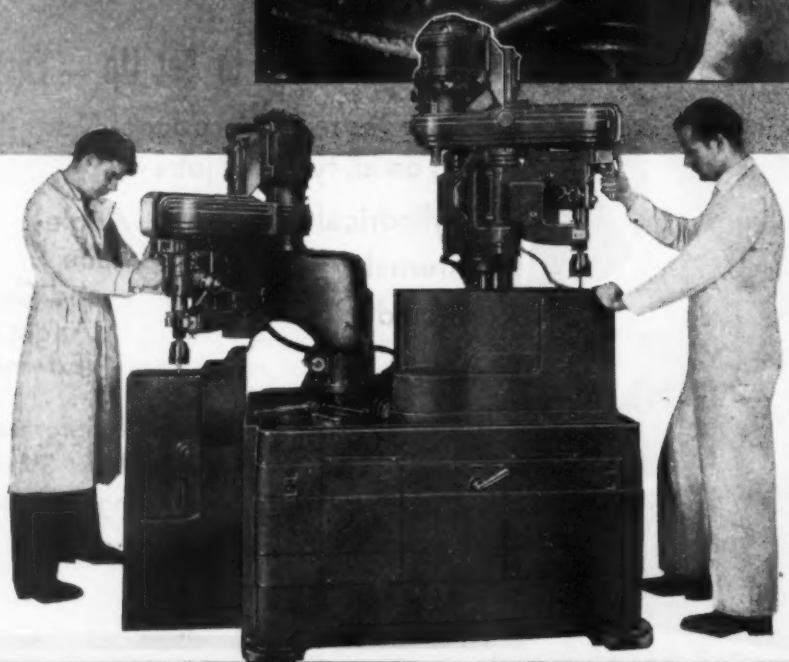
BROWN & SHARPE

Here's a way to L

When the external thread accuracy on Radio Stator Rods produced at Weatherhead Company, Cleveland, could not be held to the required limits (.0744/.0724) this minute job was handled successfully on a Warner & Swasey No. 10 Precision Tapping and Threading Machine on a production basis.



The Warner & Swasey No. 11 Precision Tapping and Threading Machine shown at the right has been on the job for the Purolator Products Company, Newark, N. J., *running continuously* 24 hours a day for *over three years.* These aluminum Aircraft Oil Filter Heads are tapped to meet military requirements. Tap 7/16"-18 thread, Class 3 fit. Tapping depth held to .010".

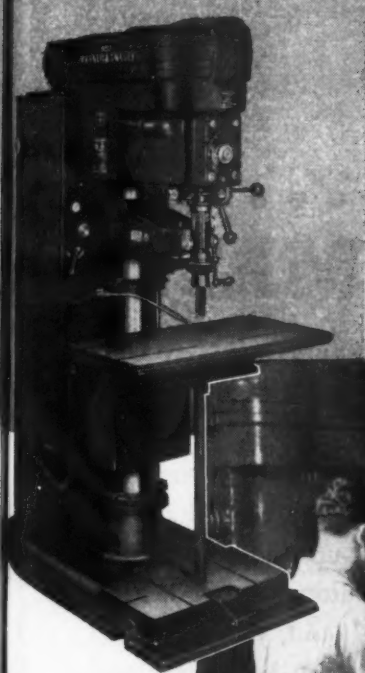


The Warner & Swasey No. 11R Radial Tapping and Threading Machine can be equipped with an additional tapping head as shown at the left. Each tapping head of this Dual Radial Machine operates independently of the other, each has its own drive motor, elevating mechanism and controls. This makes possible the tapping of two different pieces of work at the same time, or the tapping of different size holes in the same type of work.

TURRET LATHES · SADDLE AND RAM TYPES · CHUCKING AND BAR

LICK YOUR Precision Threading Problems

The lower photo on this page shows a battery of Warner & Swasey No. 12 Precision Tapping and Threading Machines used by United Aircraft Products of Dayton, Ohio. These machines tap hundreds of vitally needed aircraft parts. The operator on the left of the photo is tapping aluminum Aircraft Strainer Bodies . . . a ⅝"-27 pipe tap with depth held to ½ thread. Production 60 pieces per hour.



WHEN threading jobs are being done to close tolerance limits and depth accuracy is all-important, you can do the job more efficiently by using the machine that is specifically designed for such work.

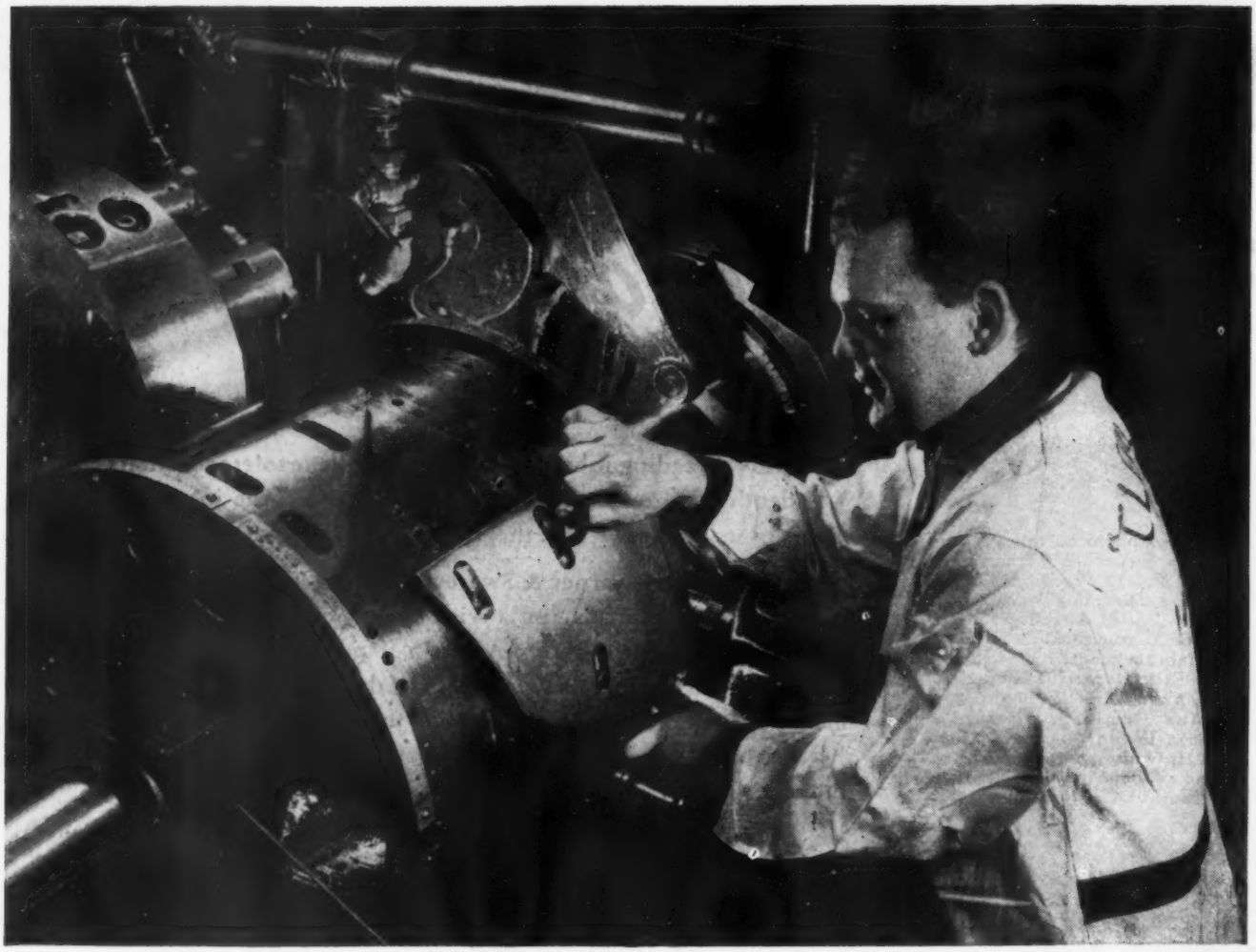
Many users of Warner & Swasey Precision Tapping and Threading Machines are producing a wide variety of intricate parts which must be held to strict Army Air Force specifications. The tapping operations on these parts are usually the last of many precision machine operations. An imperfect thread at this stage means the scrapping of a costly piece and the loss of all preceding time-taking operations.

Precision aircraft work on a production basis presented problems which these companies solved by purchasing Warner & Swasey Precision Tapping and Threading Machines . . . machines especially designed for precision threading.

Overcome your precision threading problems by employing these new machines with a revolutionary leading-on principle. Ask your Warner & Swasey representative to prove the advantages of the patented lead screw and to show you how hundreds of manufacturers are producing precision threads on a production basis.

WARNER & SWASEY · CLEVELAND, OHIO

TOOLS · TAPPING AND THREADING MACHINES



Cost Saving Starts Here... On CLEVELAND AUTOMATICS

This is a picture of a familiar critical stage in automatic machining—the set-up. On a Cleveland Single Spindle Automatic Machine this important element of cost is reduced to unusual simplicity by Cleveland's exclusive Universal Camming feature. It's just as easy as it looks.

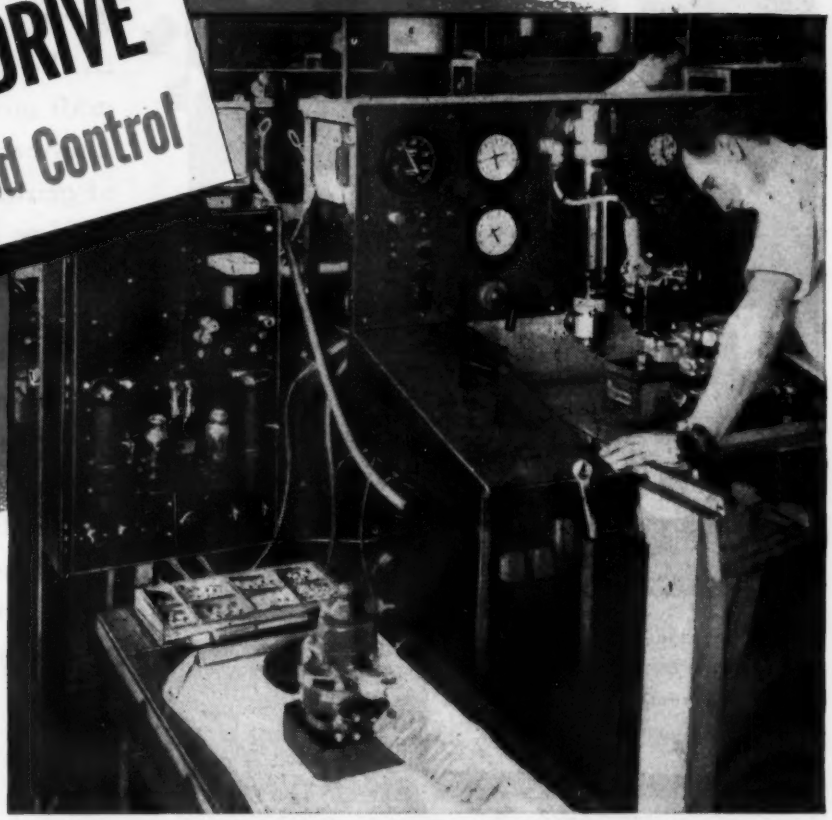
Standardized cams, designed to impart the correct forward action and rapid traverse return to the tools, are so quickly and easily adjustable that even small lot, short run jobs can absorb the set-up time with profit. Add to this the high speed of Cleveland Automatic production on bar and tube stock from 1 1/16" to 10" and you find that Clevelands have universal economical application. Let a Cleveland production engineer give you a "cost figured" illustration of Cleveland advantages on YOUR type of production.

Just Remember... Clevelands Cut Costs

CHICAGO (6):
1408A Civic Opera Building
DETROIT (2):
540A New Center Building
NEWARK (4):
902A American Insurance Bldg.
CINCINNATI (12):
4932A Beech Street
HARTFORD (1):
529A Capital National Bank Bldg.

THE CLEVELAND AUTOMATIC MACHINE CO.

ELECTRONIC DRIVE with Stepless Speed Control



Thy-mo-trol electronic panel shown at left with cover removed

HELPS CHECK RPM to one "rev" in 3000

To test pitch-adjusting propeller governors to an accuracy within 1 rpm at maximum speed, Nash-Kelvinator Corporation needed second-splitting test stands far more precise than any conventional type available. Furthermore, the testers had to provide for measurement throughout the full range of rpm over which the governors were to operate.

In designing a new precision unit for the job, Nash-Kelvinator engineers required a motor drive which 1.) had the ability to maintain closely the required operating speed, 2.) provided wide speed range, and 3.) had a simple means of rapidly adjusting speed as desired. G-E Thy-mo-trol drive met all of these requirements.

Operated from a regular a-c power line, Thy-mo-trol furnishes smooth d-c motor torque to drive the governor at the desired speeds. The governor, in turn, controls a hydraulic system which simulates the pitch-adjusting mechanism of the propeller. The Thy-mo-trol drive is a "stand-in" for the propeller system. The Thy-mo-trol control circuit is tied into the hydraulic system so as to permit changing governor speed to duplicate the response of the propeller system, and thus provide a ground test of the governor.

Thy-mo-trol drive offers unusual advantages to designers of highly advanced machines, whether they be testers, machine tools, or special production devices, such as coil winders and welders. A single co-ordinated set of equipment furnishes *fully controllable* d-c motor torque from an a-c supply. Constant-current acceleration and constant speed under varying loads are inherent in the Thy-mo-trol system.

Standard Thy-mo-trol drives, including d-c motor, electronic panel, transformer, and control station, are available from 1/8 to 25 hp. G-E engineers will help you select and apply Thy-mo-trol drives or explore their suitability for new types of jobs. Ask for Bulletin GEA-4025. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

876-175-8900

Buy all the BONDS you can—and keep all you buy

THY-MO-TROL DRIVE

where accuracy really counts

AFTER expending costly machining time in the production of master rods for aircraft motors . . . it is too late to take any chances with the final finishing operation of grinding the joint faces which must be held to extremely close tolerances.

This HILL "Open Side" Horizontal Spindle Hydraulic Surface Grinder is equipped with an auxiliary cross feed attachment with calibrated dial.

The precision attachment allows for the instant setting of the grinding wheel to fractional thousandths . . . thereby speeding production and eliminating the possibility of manual error.

Unretouched photo of 18"x 18"x 60" HILL "Open Side" Horizontal Spindle Hydraulic Surface Grinder.

ALSO BUILT IN VERTICAL SPINDLE DESIGN

The HILL ACME Co.

6400 BREAKWATER AVE • CLEVELAND, OHIO

NEW!

and definitely BETTER

STANDARD *Decimatic* DIAL INDICATOR

★ *BETTER because:*

Newest addition to STANDARD line, purposely designed to give you these gaging advantages:

★ Perfect repeatability, whether workpiece is applied slowly or abruptly.

★ Hand registers instantaneously, without whip or waver. Red hand lessens fatigue; speeds inspection.

★ Decimal dial graduations, as on blue print, eliminate errors in reading.

★ Reduced spindle tension, in some models up to 50%, and reduced internal friction give greater sensitivity.

★ Range less than one revolution. Avoids errors on parts more than a revolution oversize. (Range may be increased by removing stop collar).

★ Patented "Shockproof" design protects mechanism and is key to the *superior* accuracy of this Indicator.

★ Upper half of face free of excess markings to facilitate easy reading.

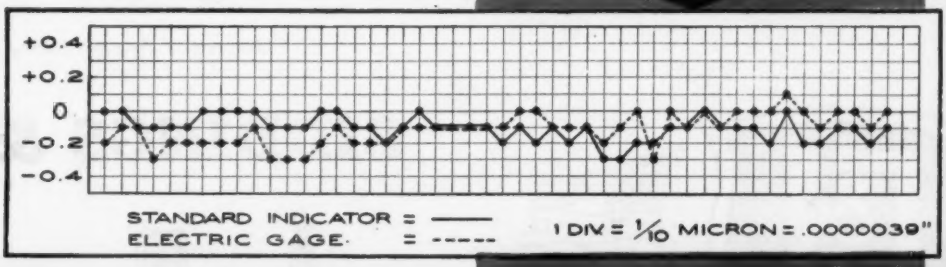
★ All mounting dimensions AGD standards.

Ask for Special Decimatic Bulletin

Catches Rejections Red-Handed

Graph of impartial test by prominent gage user. STANDARD *Decimatic* repeatability checked against elaborate electric gage costing more than ten times as much. Note greatest difference in readings does not exceed 2/10 micron.

A Convincing Comparison of Precision

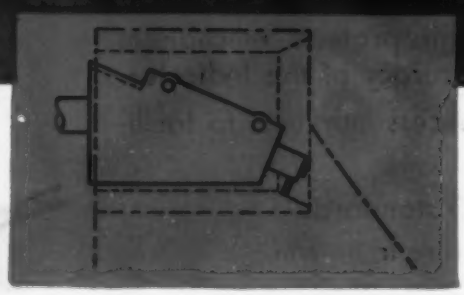


ARMY (E) NAVY

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Special taper boring tool mounted on machine spindle showing cutting tool in position to recess outer bore. This cutter is removed and placed on opposite side of tool slide to bore inner recess.

Boring tapered recess in a steel casting which is welded to a steel base. Note the simple method of mounting the weldment on the machine table.



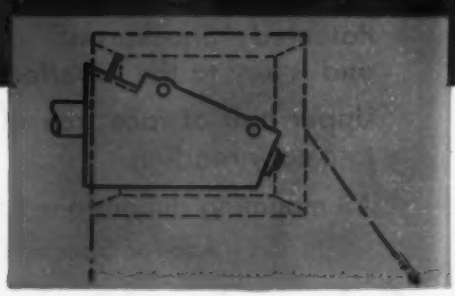


Diagram of the taper boring tool in operation.

GIDDINGS & LEWIS

138 DOTY STREET

Right: G. & L. Table Type Machine.

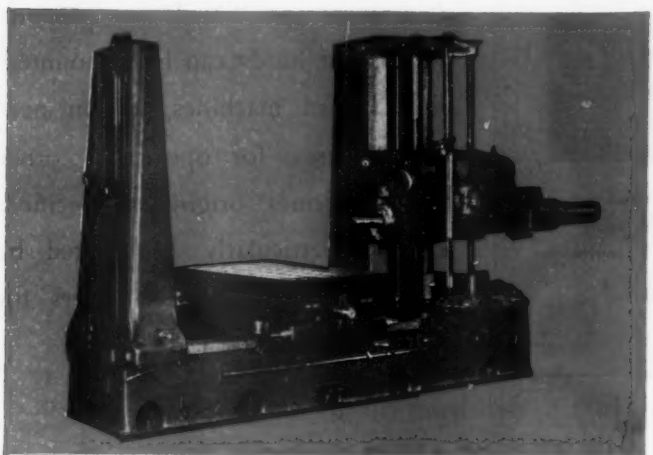
Right: G. & L. Floor Type Machine.

84% Less Time Required
To Bore These Tapered Roller Seats

G. & L. Horizontal Boring Machine Equipped With Special Taper Boring Tool Saves $56.00 on Each Part... Costly Holding Fixture Unnecessary

• Machining time on this landing craft component was cut from 12 hours to 2 hours by using a G. & L. Horizontal Machine equipped with a special taper boring tool. Cost of boring the tapered recesses was $67.00 per part. Reduction in machining time saves $56.00 on each component. These savings are a direct result of the flexibility of the G. & L. machine and the special taper boring tool.

Each recess is bored separately. The taper boring tool has a sliding tool holder set at an angle and is arranged for a cutting tool to be mounted on each end. When one taper bore is completed in the steel casting, the cutting tool is removed and the opposite tool is set to recess the opposite bore. As the machine spindle is fed out, a connecting link in the taper boring head engages the sliding tool holder and moves it in its guide to form the taper.



No. 340-T Giddings & Lewis Horizontal Boring, Drilling and Milling Machine.

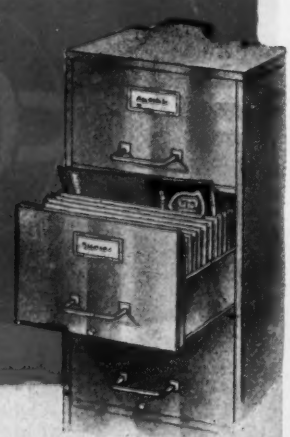
There is a size and type Giddings & Lewis Horizontal Boring, Drilling and Milling Machine that can be selected to fit your work requirements. In addition, Giddings & Lewis manufacture a complete line of accessories and attachments which may be used on this machine to reduce overall machining costs on specific work. These attachments and accessories include: the Continuous Feed Facing Head, angular milling attachments, plain and power driven rotary tables and many others. When used with the G. & L. Horizontal they effect material savings in machining large, unwieldy work.

Formerly it was necessary to mount the part in a costly holding fixture on another type machine. It is now mounted on the machine table and requires no fixture. This is an excellent example showing the simplicity and ease of mounting work on the G. & L. Horizontal and also the flexibility of the machine in performing unusual operations.

Many manufacturers confronted with similar jobs are using their G. & L. Boring Machines to reduce production costs. Sometimes it is necessary to use accessory equipment such as this taper boring tool, but in most cases the machine is readily adapted to practically any type of work. In those instances where machining problems are difficult, G. & L. engineers will gladly help solve such problems. There is no obligation for this assistance.

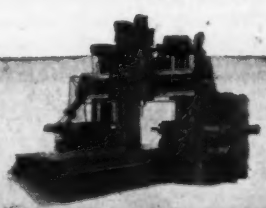
Additional Data

...covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your free copy today—please indicate your business connections. Ask for Bulletin No. AM-25.



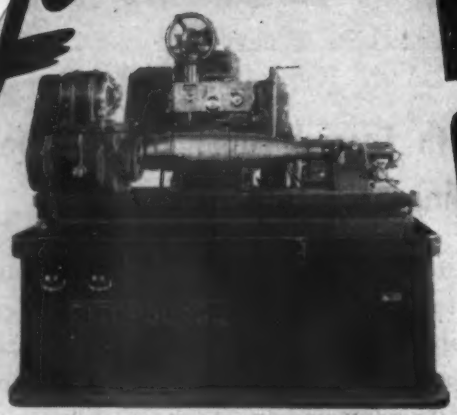
MACHINE TOOL CO.
FOND DU LAC, WIS.

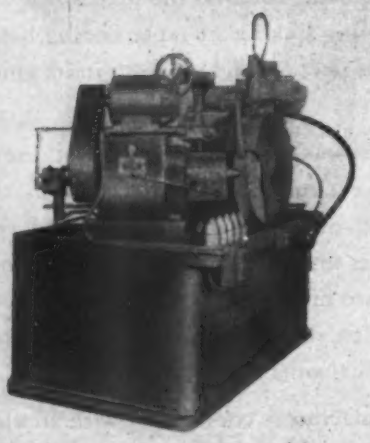
Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

You can RECONVERT FITCHBURG GRINDERS





This book shows how to cut grinding costs . . . Sent free . . . write for it today.

With reconversion ahead Fitchburg users should keep in mind all Fitchburg Bowgage Head Precision Grinding Wheelhead Units are standard and interchangeable.

If the grinding operations for which they were purchased are discontinued, the heads can be remounted on standard machines, or on new special bases, for operations other than the ones originally specified. This is particularly appreciated by those using Fitchburg Grinders for ordnance production.

This exclusive Fitchburg feature protects your investment, and we suggest that future buyers of special purpose grinders or plain cylindrical grinders first consult Fitchburg engineers. Write us today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

THESE HARDER TOOLS FOR HARDER JOBS

Staples specification on hardness of body for reamers established a new high standard for the industry.

Other Staples quality features include more accurate diameters; diamond lapped finish on carbide; and finish grinding of all flutes. And Staples makes the only expansion reamer which produces accurate holes after expansion without regrinding. Important savings result.

Cut your costs and speed your production by using Staples superior cutting tools. *Standard tools are available from stock.* Ask us also about Staples special tools, designed to meet your special needs.

Staples Tool & Engineering Company
Cincinnati 25 . . . . . Ohio

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

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THOMPSON *Precision* GRINDERS

producing accurately ground tools

In a large eastern machine tool plant this pair of Thompson Grinders is used to grind a wide range of tools including carbide tipped tools of various kinds.

An accurate, smooth grind, faster and easier features the operation of the Thompson Grinder. Any number of table speeds from 10 to 100 feet per minute provide versatility. Hydraulic control of both the wheel head and table insures a smooth, accurate finish.

The machines illustrated are typical of the great number of Thompson Grinders operating in tool rooms—tool shops—and in many high production shops.

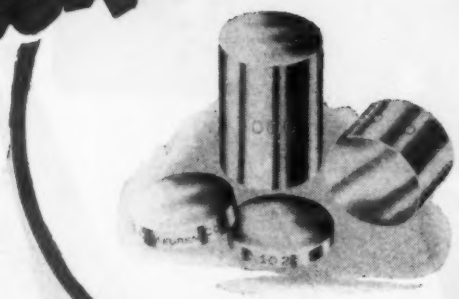
Consult Thompson on your grinding need—from the smallest to the largest—from the most simple to the more complex operations.

Thompson Grinders are available in flat surface—vertical—broach—and contour types to meet practically every grinding need. Surface grinders are available in types and sizes up to the largest type "C", 36" x 36" x 240".

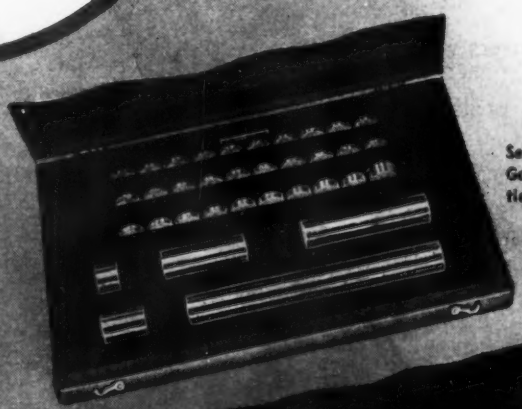
THE Thompson GRINDER CO.

SPRINGFIELD, OHIO

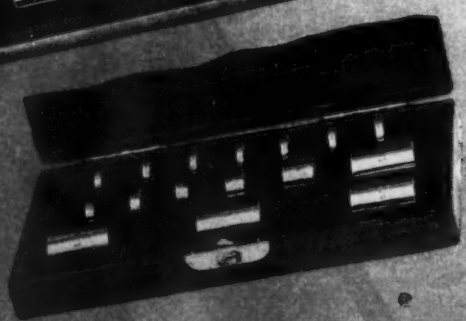
Van Keuren



MICROGAGES



Set MTT MICROGAGES. 35 Gages giving 140,000 combinations $95.00



Set MT MICROGAGES. Over 5,000 combinations in thousandths $35.00

A FOUNDATION FOR ACCURACY FOR 25 YEARS

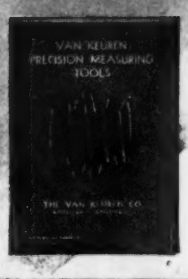
VAN KEUREN MICROGAGES are high precision working gages, designed for use on all ordinary work and economically practical for use in production because of their low cost. Their great value in general shop use lies in the fact that they enable the workman to achieve the accuracy required by the inspector.

MICROGAGES are of first quality oil hardening alloy tool steel, exceptionally hard, carefully seasoned, with accurately flat and parallel mirror-like surfaces. They combine readily by wringing together and because of their size (11/16" dia.) are ideally suited for checking heights, widths, slots, machine set-ups, gage setting and many other uses. They are made round in order to assure the best distribution of wearing surface, which is about equal to that of rectangular gage blocks.

MICROGAGES up to 1" in length have a tolerance of plus .000015" minus .000010". They average 5 millionths of an inch oversize which provides the WEAR ALLOWANCE feature of these gages.

VAN KEUREN MICROGAGES are available in sets especially designed for general shop use, for gage setting and for toolmakers and machinists. Individual MICROGAGES in standard sizes are also available in a size up to 6" in length.

Toolmakers MICROGAGE SET M44. Gives 121 combinations $15.00



Complete details on MICROGAGES and the full line of Van Keuren Precision Measuring Tools are contained in Catalog No. 32, a 144-page manual for toolmakers, machinists and inspectors—sent promptly on request.

Van Keuren

25th YEAR

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Replacement — Light Wave Micrometers — Gage Blocks — Taper Lock Plug Gages — Wire Type Plug Gages — Measuring Wires — Thread Measuring Wires — Gear Measuring System — Shop Triangles

J&L STEEL

Our metallurgical engineers will be glad to discuss your production problems with you.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA

SPECIAL COLD DRAWN SHAPES SAVE MACHINING

ENGINEERING

PROCESSING

DESIGNING

BUILDING

TOOLS

DIES

JIGS

GAUGES

SPECIAL

MACHINERY

Write today for this book

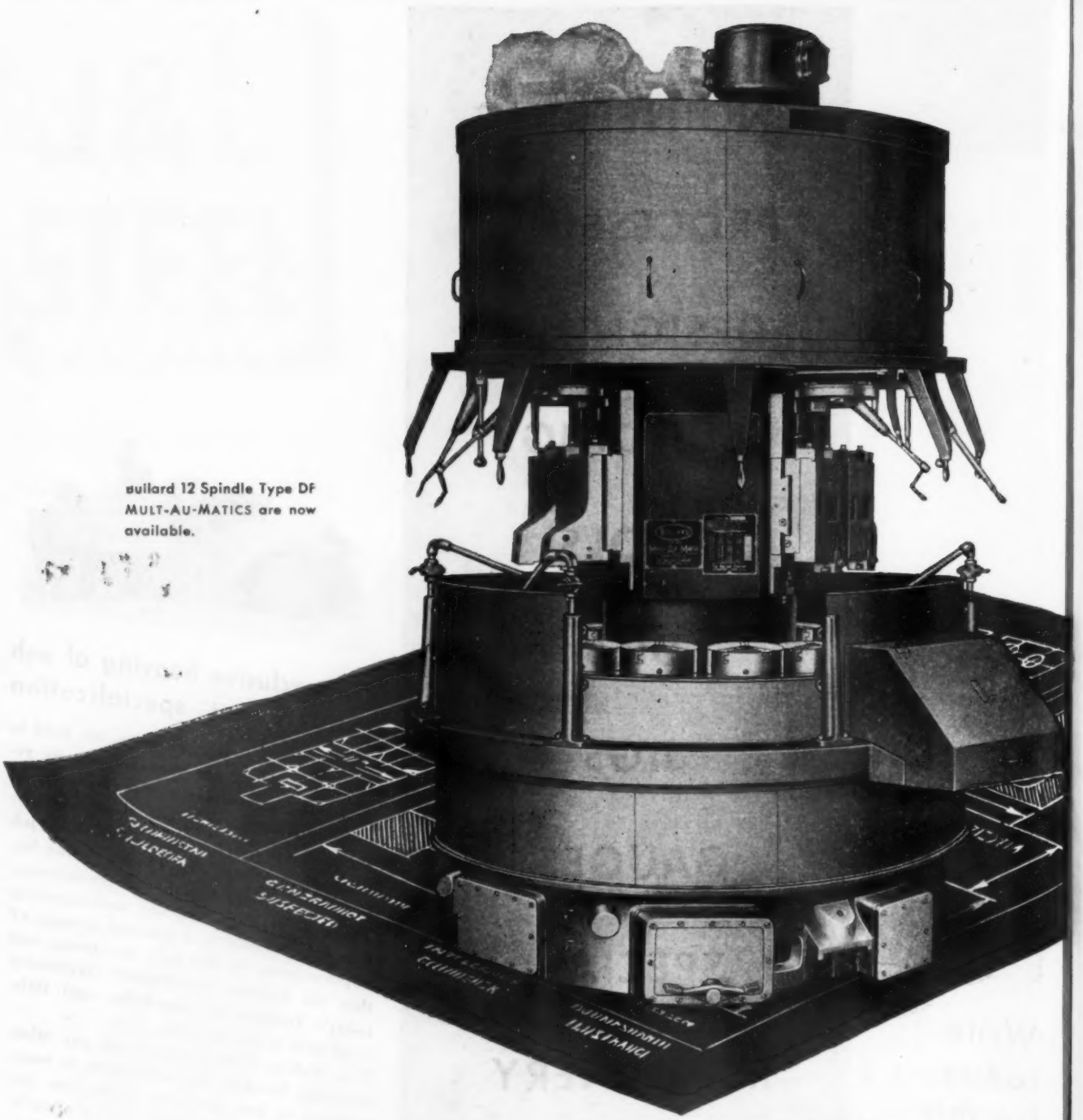
The exclusive heaving of ash cans is not specialization

Neither the fact that he limits his field to garnering ashes, nor the fact that he repeats the performance for forty years makes the collector a sanitation engineer. To be a specialist a man must do a job better than anyone else can do it who has less experience or who divides his interests. There is even an implied understanding that the specialist is a constant pioneer of improvements in the area he covers, and that his current performance represents today's frontier of knowledge and technical skill in his specialty.

That Vulcan Tool Company or any other specialist blankets that definition in every instance is too much to claim, but the reason we have hit the bullseye so often is because *we never fail to aim for it.*

The VULCAN TOOL Co.

213 NORTH BECKEL STREET DAYTON 3 OHIO



Bullard 12 Spindle Type DF MULT-AU-MATICS are now available.

BULLARD MULT-AU-MATIC . . . TYPE DF

Twin Tooling Doubles Production With Investment Up Only Slightly

On work up to 8" in diameter and 10½" in height, you can now produce two finished pieces in the time of the longest single boring, turning, facing, threading, grooving or drilling operation plus a few seconds for indexing.

Twin spindles at each of the six or eight stations and twin tooling on the head of each working station mean that you double the ordinary MULT-AU-MATIC production output for its size of work.

That's lowering unit production costs in earnest . . . a *must* if free enterprise is to increase buying power and preserve full employment.

For full details about Bullard Twin 6 and Twin 8 Type DF MULT-AU-MATICS, write today for Bulletin DF1.

The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE

3 Good Reasons why you'll like this New Norton Vitrified Bonded* Diamond Wheel

for Grinding Chip Breakers

1. Holds Its Corner—Much of the ability of the Norton Vitrified Bonded Diamond Wheel to show such amazing life is due to the way that the corners stand up. Even in the hands of inexperienced operators this wheel holds a sharp corner and does not require the frequent trueings that shorten life.

2. Cuts Fast—Examine this wheel closely and see the more open structure of the vitrified bond. Just as you would expect, this means a faster and cooler cutting action.

3. Has Long Life—Vitrified bond is heat-resistant and does not soften under the temperatures developed by grinding. Thus you can expect at least twice the life of resinoid bonded diamond wheels—**often many times more**—from the Norton Vitrified Diamond Wheel.

Try this wheel on your chip breaker grinding. Contact your Norton abrasive engineer or your Norton distributor.

NORTON COMPANY
WORCESTER 6, MASS.

*Patented

Norton Vitrified Diamond Hone

Hundreds of cemented carbide tool users are enthusiastic about this new Norton development for these four reasons: 1. Cuts fast; 2. Resists wear; 3. Stays sharp; 4. Is easy to use.

NORTON ABRASIVES

PRECISION

— AS VITAL IN WAR AS IN PEACE

In every theater of war South Bend Lathes are holding to their pre-war traditions for dependable precision. In the mobile machine shops of our mechanized forces they duplicate factory tolerances on intricate parts needed for emergency repairs on guns, tanks, trucks and other essential equipment. On board many of the Navy's fighting ships, where high precision is an absolute requirement, they are also depended upon for maintenance and repair of mechanical equipment. In the repair bases of the Air Forces they play an equally important part in keeping planes in service. Sometimes small South Bend Lathes are even flown to remote locations for making quick repairs on grounded planes.

In all classes of war service these lathes are doing fine precision work—not only with the armed forces but also in industry where dependable accuracy is as vital as speed and versatility in meeting war's urgent production schedules.

When civilian production is resumed South Bend precision will again prove as indispensable to peace-time industry as it is now for exacting war work. Embodying the improvements developed to meet war production requirements, South Bend Engine Lathes and Toolroom Lathes will be available, also the South Bend Precision Turret Lathes having ½" and 1" collet capacity.

NEW CATALOG NOW READY

Write For It!

Illustrated in full color—this new 64-page catalog shows all types of South Bend Lathes, Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swing. Precision Turret Lathes with ½" and 1" collet capacity. Shows complete line of accessories and attachments for use with these lathes. *Ask for Catalog No. 100-D.*

Lathe Builders for 38 Years

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA

THE exacting requirements of thousands of war products have put a high premium on precision work. In the production of peacetime civilian goods, competition will prove an equally strict taskmaster.

For precision filing, Nicholson is prepared with the most carefully designed, accurately cut and uniformly hardened line of Swiss Pattern Files in the world. "X.F." in the Nicholson Swiss Pattern File trade-mark means "EXTRA FINE" . . . and, associated with the name "Nicholson," it carries the sweeping guarantee of *Twelve perfect files in every dozen.*

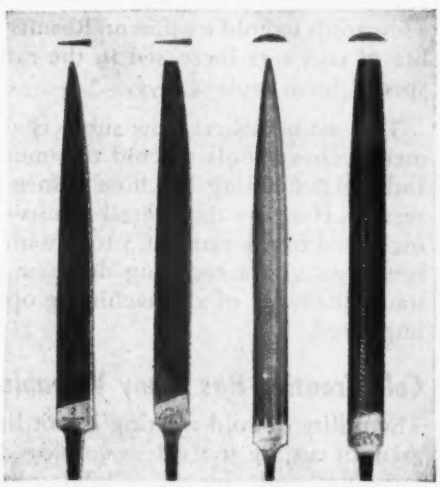
Consult your mill-supply house regarding X.F. Swiss Pattern Files in such groups as: Die Sinkers, Round and Square Handle Needle, Filing Machine, Rifflers, as well as special shapes for fine-instrument or delicate-parts fitting and finishing.

NICHOLSON X.F. SWISS PATTERN FILES are manufactured in accordance with the original Swiss designs, which differ in a number of respects from the American. They are made to more exacting measurements and in much finer cuts. Points are smaller and tapers longer (see typical comparison at right).

NICHOLSON FILE CO. • 29 ACORN ST., PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

***The Nicholson X. F. Swiss Pattern File** used by the machinist above is a* Slitting *file (with narrow diamond-shape cross-section and four filing surfaces).*

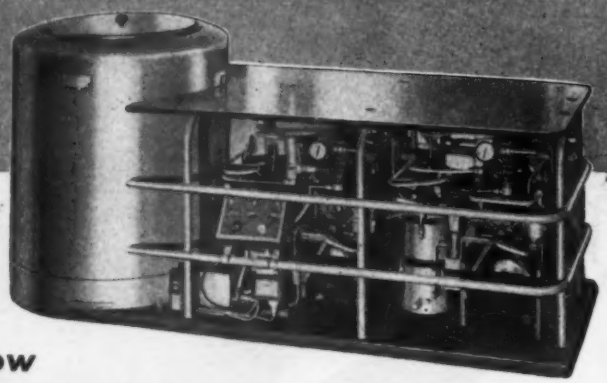
TRADE EXTRA X·F MARK FINE

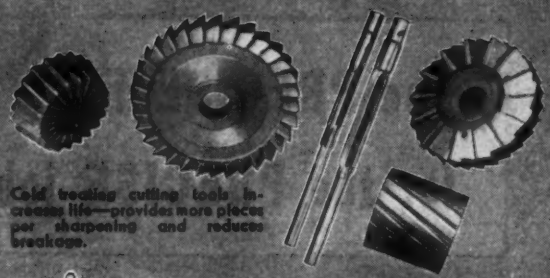


Swiss American Swiss American

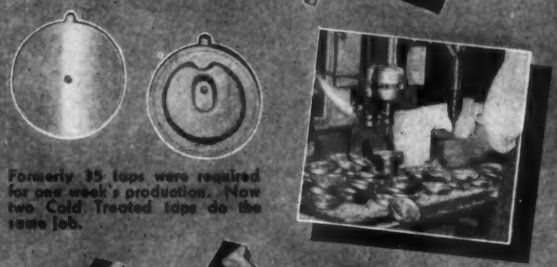
NICHOLSON FILES FOR EVERY PURPOSE NICHOLSON U.S.A. MADE IN U. S. A.

3 to 1 increase in Tool Life by Cold Treating in a Deepfreeze Industrial Chilling Machine....





Cold treating cutting tools increases life—provides more pieces per sharpening and reduces breakage.



Formerly 35 taps were required for one week's production. Now two Cold Treated taps do the same job.

Life of this special form tool was increased from 25 to 50 pieces per grind by DEEPFREEZE Cold Treatment.

How this Manufacturer Improves Machining Efficiency by Cold Treating All Types of Cutting Tools Used in the Plant

This report shows how a large mid-western manufacturer tripled tool life, improved efficiency of machining operations and minimized machine down time by instituting a plant-wide program of cold treating all high-speed steel cutting tools.

Greater Tool Economy By Cold Treating

Prior to cold treating, frequent sharpening and breakage were common. It was therefore decided to subject a few tools to cold treatment. Results were outstanding; life of taps was increased in the ratio of 15 to 1 and special form tools 2 to 1.

This manufacturer now subjects all high-speed steel metal cutting tools to cold treatment in a Deepfreeze Industrial Chilling Machine before putting them into service. Here are the overall results—life of all tools is increased in the ratio of 3 to 1 with considerably less breakage, and a resulting decrease in machine down time. Efficiency of all machining operations is greatly improved.

Cold Treating Has Many Valuable Applications

The utility of cold treating is not limited to the treatment of cutting tools. It is employed with equally outstanding results for the following purposes: shrinking metal and shrink-fit assembly; stabilization of gauges and machine parts; testing of instruments and materials.

How Deepfreeze Engineering Service Can Help You

Our pioneering and extensive experience in the field of cold treating enables us to analyze your requirements and show how cold treating can be applied to your production. This service is offered without cost or obligation.

FREE...TREATISE ON COLD TREATING PROCEDURES

This 48-page Deepfreeze Technical Data Bulletin contains valuable information on Cold Treating Methods, procedures and results obtained by many of the nation's leading manufacturers. Also included are specifications on standard models of Deepfreeze Industrial Chilling Machines. Write today for your copy of this valuable Bulletin No. I-4.

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

2327 DAVIS STREET, NORTH CHICAGO, ILLINOIS

DIVISION OF MOTOR PRODUCTS CORPORATION DETROIT, MICHIGAN

SIDNEY *Precision* LATHES

● The Sidney Lathe Bed shown is provided with four longitudinal walls with cross girts at 12 inch intervals—assuring accuracy under the heaviest service—resisting deflections and twisting strains.

Actual tests have proved this design far superior to the two wall construction.

This type of bed provides adequate support to the various units of the lathe and is essential to eliminate vibration and assure accuracy in meeting present day demands.

The bed is cast of semi-steel nickel mixture which gives a close grained, hard bearing surface to the ways which are provided with force feed lubrication and protected with Neoprene wipers.

The SIDNEY MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY • OHIO
ESTABLISHED 1904

LET'S STUDY THIS GRINDING WHEEL BOND PROBLEM TOGETHER

Bond, in a grinding wheel, is the "cement" that holds the abrasive grains together. There is a difference between a bond's toughness and strength. For example, a pane of glass may have great strength, but shatter readily upon impact. A grinding wheel's bond must be strong to produce extra grinding hours, yet it must not shatter and release the abrasive grains before they have become dull. To develop proper strength, elasticity, and friability of bonds is the function of Sterling's laboratory technicians.

Different metals demand different grinding wheel bonds. Because Sterling men have spent years in investigation and solution of literally thousands of different grinding problems, the selection of the proper bond for your "Wheels of Industry" can now be accomplished with scientific accuracy.

Some of Sterling's bonds are years old . . they have stood the test of long use. Some have been recently introduced . . these fill a new need. Collectively, Sterling's bonds offer a wide range of possibilities for the quick solution of your grinding difficulties. There is Sterling's T Resinoid Bond for surfacing operations . . Sterling's P Resinoid Bond for snagging all types of steel, grey iron, brass, etc. There is Sterling's "25" Bond, used so successfully in Sterling's New Easymount Wheels for carbide grinding. There are many others (the selection is almost unlimited) from which a Sterling engineer can make the proper choice. A letter from you is all that is necessary . . may we serve you?

For Better, Faster Grinding—Strong Bond "Posts" Between Each Grain

This magnified view shows how Sterling's low viscosity bonds flow into and build up strong "posts" between the abrasive grains. The more circular the hole, the stronger the post. Result—better grinding . . faster grinding . . more grinding from every Sterling Grinding Wheel you use!

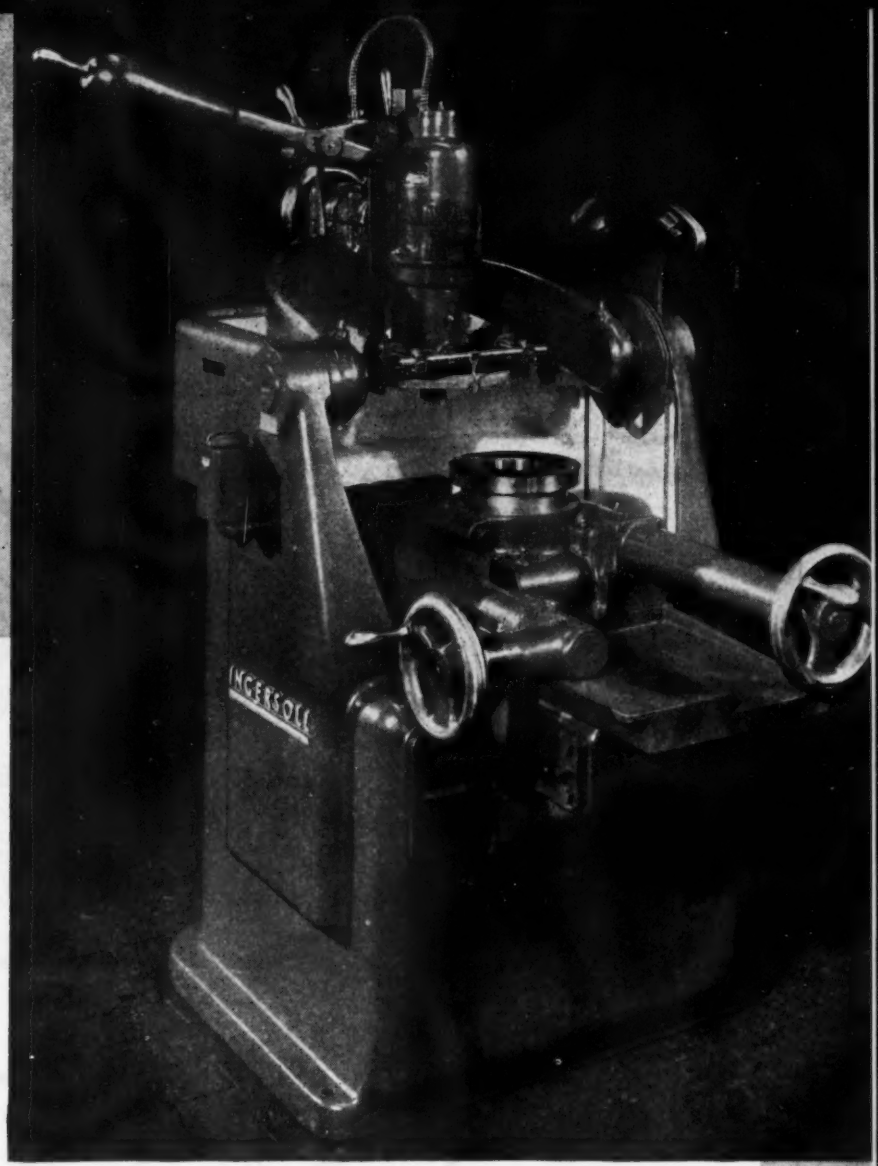
The INGERSOLL CUTTER GRINDER

★ ★ ★

CONVENTIONAL FACE MILL

INGERSOLL SHEAR CLEAR

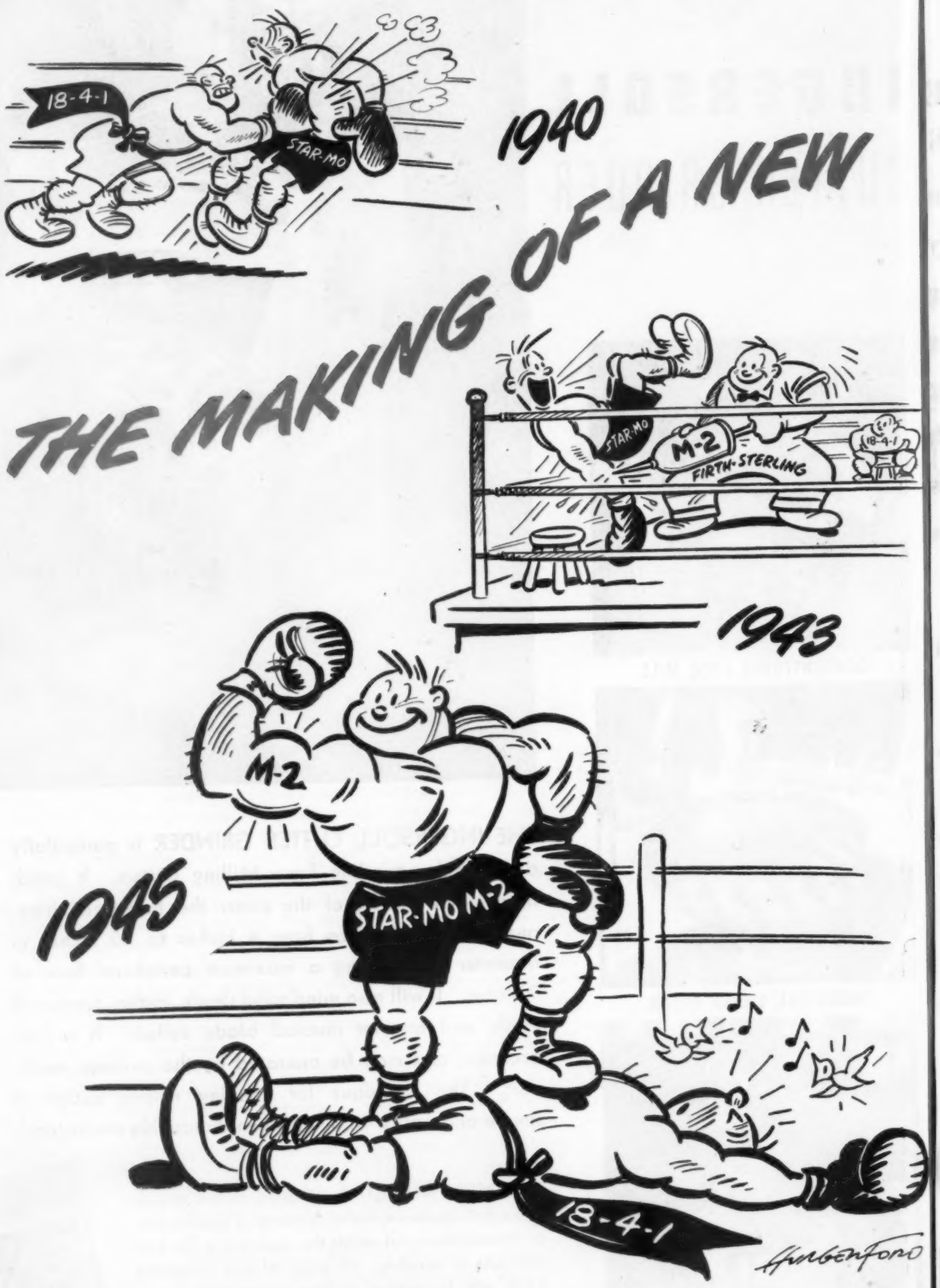
DOUBLE ANGULAR CUTTERS



THE INGERSOLL CUTTER GRINDER is particularly designed for grinding Face Milling Cutters. It grinds at a single setting of the cutter the face, periphery, and corners of cutters from 4 inches to 30 inches in diameter and having a maximum peripheral face of 7 inches. It will also grind solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate, and may be operated by the average mechanic. The technique for grinding milling cutters is simple and easily followed when thoroughly understood.

THE NEW MANUAL pictured below shows, through illustrations, the wide range of application of this machine and assists the operator in the best methods of grinding. A copy of this interesting book will be mailed to you upon request.

THE INGERSOLL MILLING MACHINE CO. ROCKFORD ILLINOIS



MAKERS OF HIGH-SPEED STEELS, TOOL AND DIE STEELS, AND SINTERED CARBIDES

HIGH-SPEED CHAMP!

STAR-MO M-2

Improved

TUNGSTEN-"MOLY" HIGH-SPEED STEEL

Ever since the new "M-2" analysis was adopted for tungsten-molybdenum high-speed steel, more and more manufacturers in the automotive and tool-making fields are recognizing with approval and satisfaction this new Firth-Sterling champion, STAR-MO M-2.

They have seen this new steel in action. They find it excels 18-4-1 in their plants. They are supporting it with enthusiasm because it is giving satisfactory performance continually, and adding new accomplishments to its record. Why not give STAR-MO M-2 a try-out in your shop?

Better

Outcuts and outlasts 18-4-1 high-speed steel on most applications.

Costs Less

Base price is 14% less than 18-4-1 steels, and weight is approximately 7% less per foot. Let us quote.

Easy to Handle

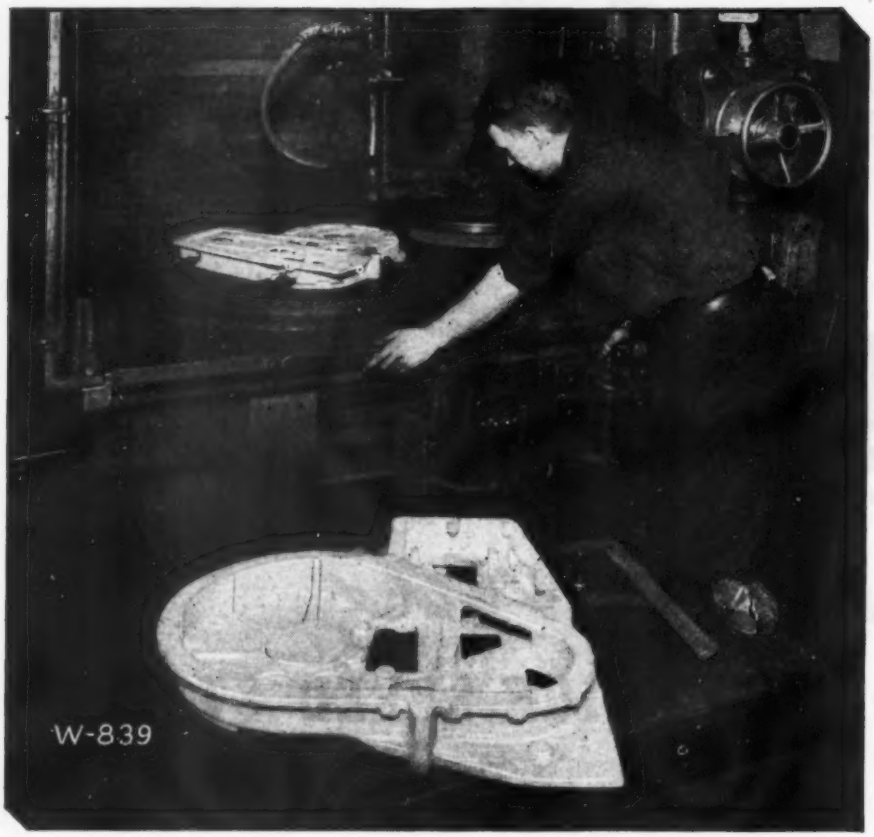
Call in a Firth-Sterling Representative to discuss applications, heat-treating methods and practical advantages.

ARMY NAVY

Firth-Sterling

STEEL COMPANY

"Put it on the Blanchard"



...GET THESE ADVANTAGES

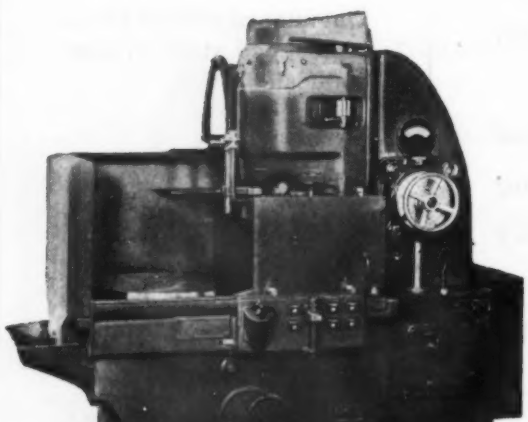
✓ **Production**
Adaptability
✓ **Fixture Saving**
Operation Saving
Material Saving
Fine Finish
✓ **Flatness**
Close Limits

Grinding Aluminum Mounting Plates

Here is another good example of a large but frail piece done on the No. 18 Blanchard Surface Grinder.

These 23½" x 22" aluminum mounting plates are lightly clamped to a steel base plate on the magnetic chuck. Two pieces (4 surfaces) are ground per hour, removing 5/32" from each surface.

When surfaces must be flat and parallel, "put it on the Blanchard".



No. 18 BLANCHARD SURFACE GRINDER

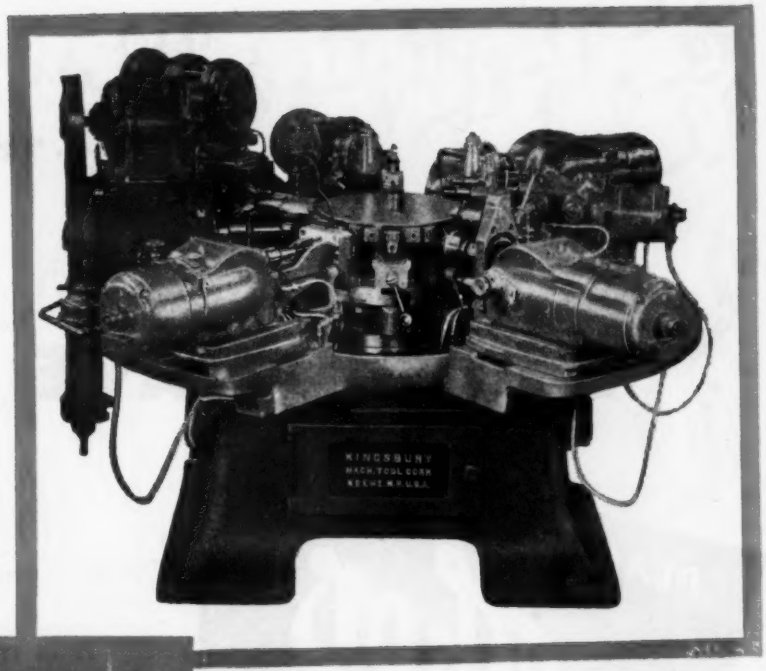
Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

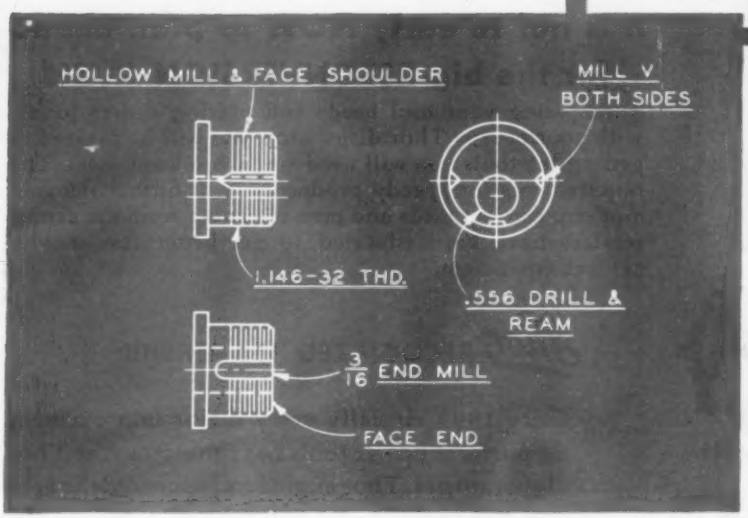
BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Ability to handle widely different operations at top speed proves the value of versatility





THIS IS A FLEXIMATIC SPEED UP JOB

FLEXIMATIC

by KINGSBURY

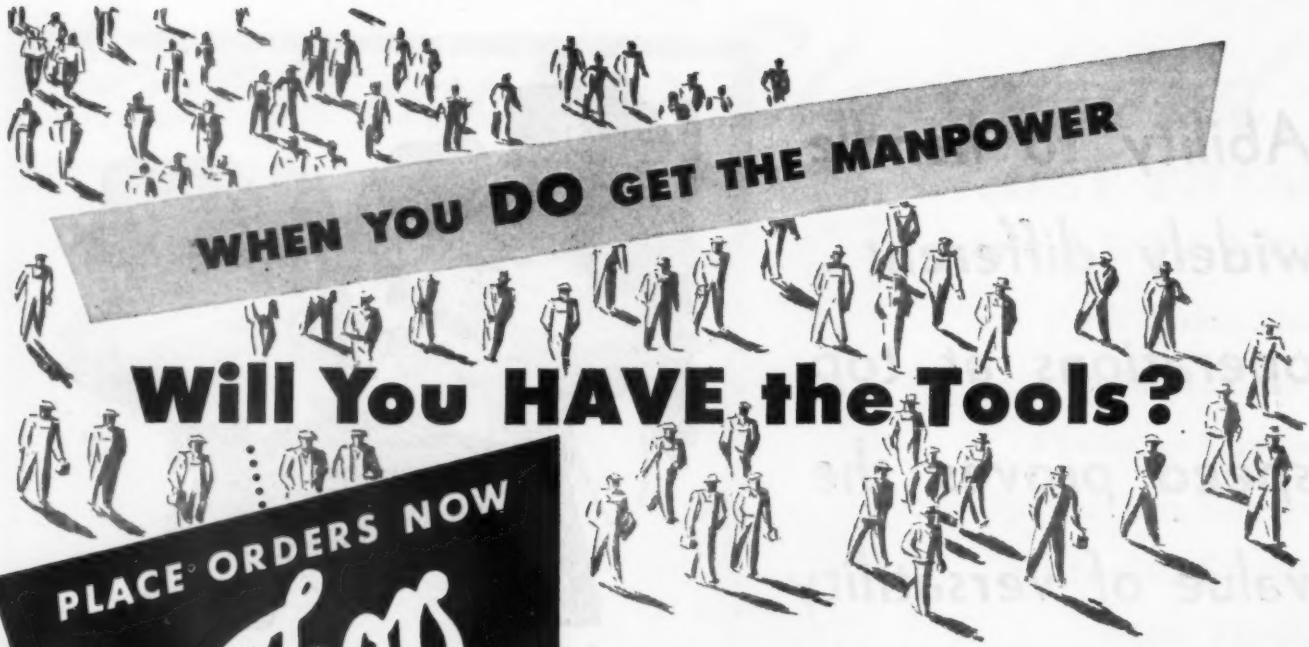
KINGSBURY versatility is well exemplified in the widely different machining operations performed on bronze lock cylinders. For example, note that hollow milling, facing, V-milling, drilling, reaming, end milling and end facing are included in this set-up on a Model GD FLEXIMATIC. By being able to handle all these operations with a *single chucking of the work*, production is stepped up tremendously.

Whether it's a lock part or a complicated piece involved in ordnance production, the FLEXIMATIC can be depended on to meet exacting requirements. Its versatility is practically unlimited because of the basic nature of the method utilized in building up standard units around an indexing turret, each unit designed for handling a specific operation. Not only does this method provide for a wide variety of operations simultaneously but also makes change-over readily possible to meet the requirements of other jobs which call for still different machining combinations.

Whatever the set-up, high production and utmost precision are assured by FLEXIMATICS.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U. S. A.



WHEN YOU DO GET THE MANPOWER

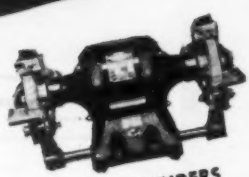
Will You HAVE the Tools?

PLACE ORDERS NOW FOR Thor PORTABLE ELECTRIC TOOLS

It is not to early NOW to plan ahead for the big RECONVERSION RUSH

Anticipating your tool needs and placing orders today, with your nearby Thor distributor, you will be assured of getting the tools you will need when you want them. The requirements for speedy production will further demand modern, efficient tools and men returning from the armed services have been educated to get better results with modern equipment.

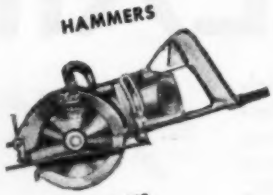
DRILLS


BENCH GRINDERS

SCREW DRIVERS

HAMMERS

NUT SETTERS


SAWS

PORTABLE ELEC. GRINDERS

NIBBLERS

ELECTRIC SANDERS

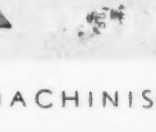
Thor RECOGNIZED LEADERSHIP

Since 1893 virtually every major improvement in portable power tools has come from the Thor laboratories. Thor engineers pioneered the field of lightweight and balance in electric tools. Thor built the first electric drill that was substantially reduced in weight and bulk without sacrificing abundant power for the toughest kinds of work. Today Thor engineers are still pioneering—perfecting—tools of more compact power and lightweight convenience to accelerate industrial production—to withstand the most severe usage and to give longer life to the tools used in industry. To be sure of getting the most in efficiency—economy and long trouble-free life from portable electric tools, specify Thor.

INDEPENDENT PNEUMATIC TOOL CO.
600 W. Jackson Boulevard, Chicago 6, Illinois
New York Los Angeles

PORTABLE *Electric* TOOLS

Branches in Principal Cities

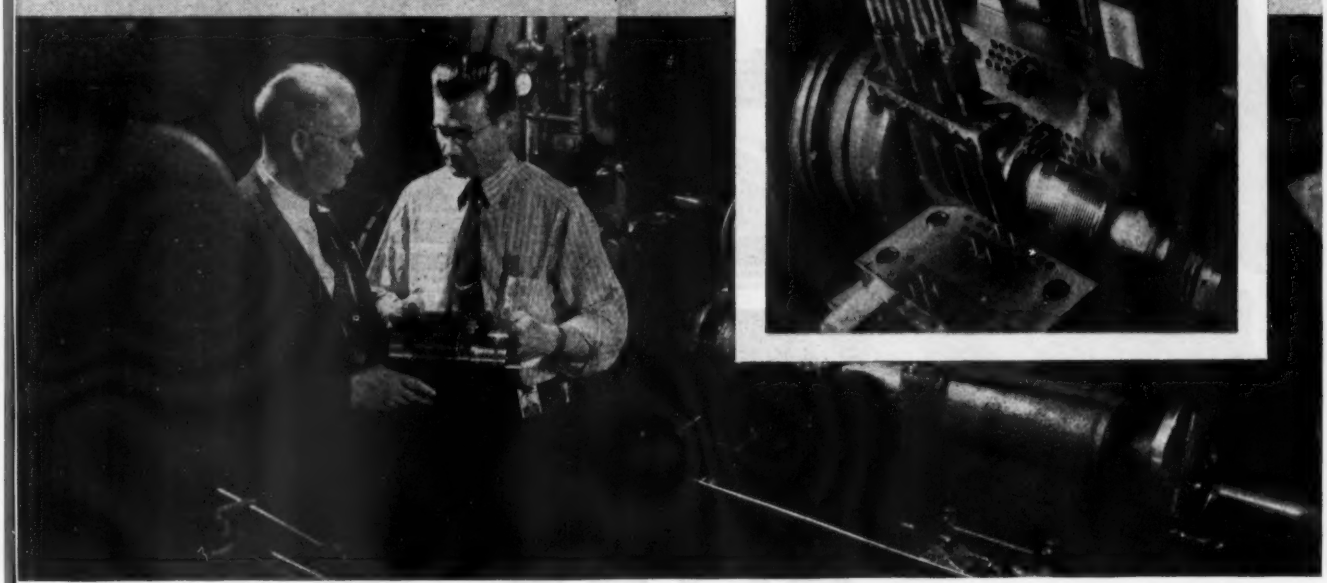


"WITH **Gulf Cutting Oils**

WE INCREASED PRODUCTION ON THIS MACHINE 67%

—TOOL LIFE OVER 100%"

says this Airplane Motor Plant Foreman



(Left) Actual photo of a Gulf Service Engineer consulting with Foreman in plant of prominent Texas aircraft engine manufacturer on cutting oil requirements for finning cylinder barrels. (Right) Close-up of finning operation.

WITH THE CUTTING OIL we formerly used, this machine finned 5 to 10 cylinder barrels per tool change, and 30 to 40 barrels per shift," says this aircraft engine plant Foreman. "With the proper combination of Gulf Lasupar Cutting Oil and Gulf Cut-Aid, as recommended by the Gulf Service Engineer, output is 15 to 25 barrels per tool change, and 60 per shift."

This is one of hundreds of war plants that have increased production and tool life on precision work by using the proper Gulf Cutting Oil or combination for each particular job requirement.

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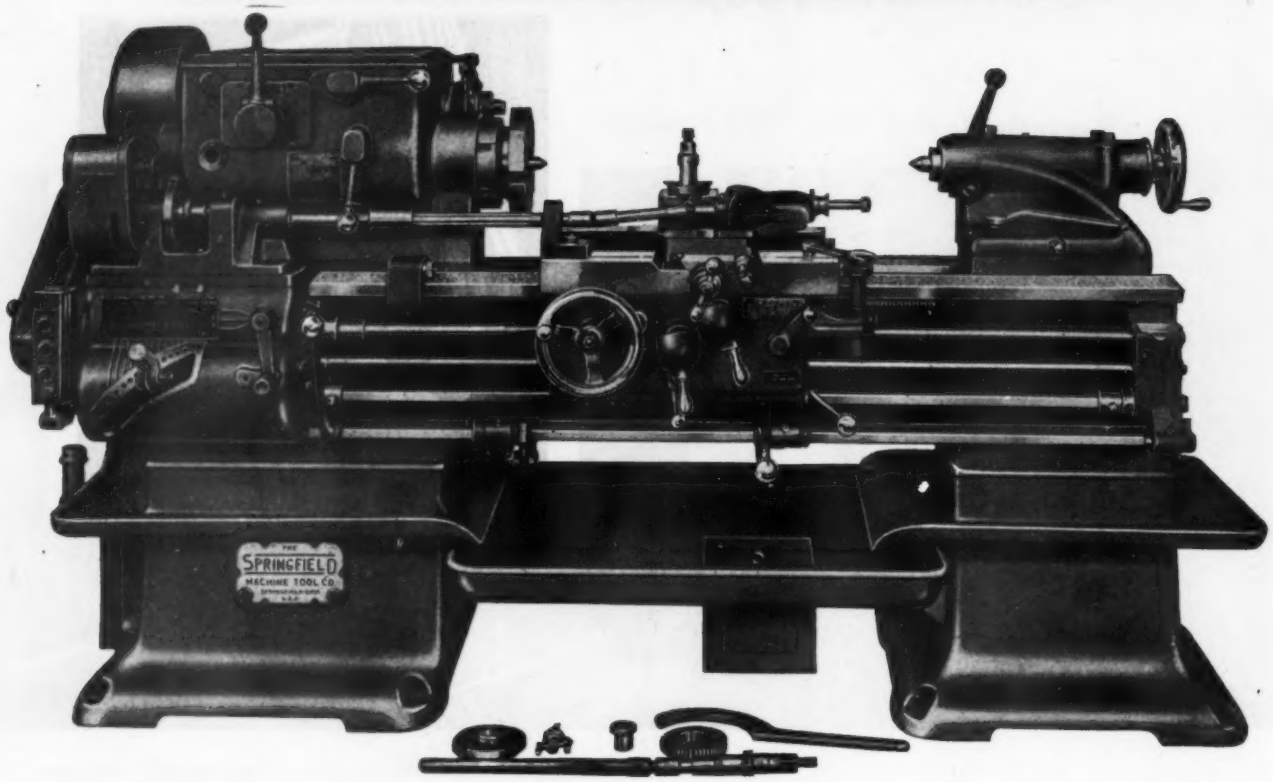

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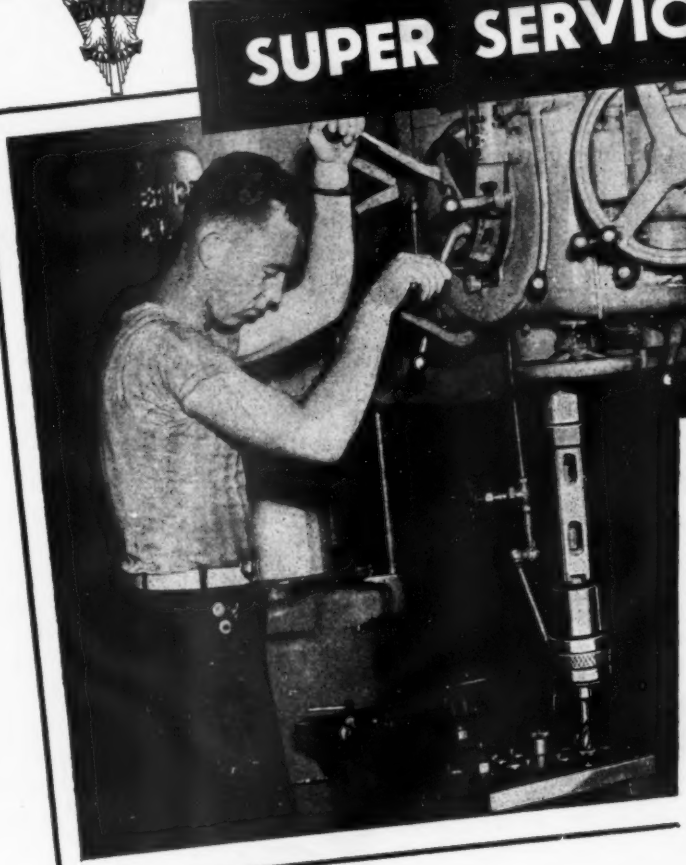

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The Wraps Are Off

THIS WAR has far surpassed all others in the extravagant use of war weapons.

The life of tanks and armored vehicles in battle is startlingly short. In France our armies have been expending artillery shell and ammunition at thirty times the rate attained in the North African campaign and at twice the rate in the Italian campaign. The record consumption of munitions in the First World War is of pigmy size compared with the usage today.

On top of the unprecedented firepower that has been thrown into the battle in Europe is the mounting of a major offensive in the Philippines as well as in other regions of the Far East. This offensive must be supported by plenty of ships, landing craft, planes, ground force weapons and other munitions of war.

We are way ahead of our original timetable in the Pacific. This means that we must have by next month the war products originally scheduled to be delivered three, four and five months hence.

New weapons have been developed and must be put into production to meet the challenge of our enemies. The jet propulsion plane program is one example.

Our "hot" aircraft program must be accelerated 300 percent from the October level by the second quarter. Ammunition manufacture should be up 75 percent or more in the same period.

More than half of the dollar volume of all war production must rise steeply. The over-all average advance from October to May should be 65 percent.

During 1944 the war production program, measured in dollars, was pared from sixty-six billion dollars a year to fifty-six billion dollars, but new demands have necessitated an about-face and today the program stands at sixty-four billions.

The increases now scheduled cannot be nicely spread over all twelve months of 1945. If they were, the materiel so urgently needed would arrive too late for our fighting forces.

As much as possible of the year's total requirements must be produced in the first six months.

For the present, the "wraps" are off on schedules. The services want all they can get of the weapons they so vitally need. The sky is the limit.

This poses a serious problem for American industry. It means that in the days and weeks immediately ahead, production of all possible critical war items must be squeezed out of available facilities.

Wherever machines are available and are adaptable to existing war jobs, they must be put to work. New machine tools must not be built if existing machines will serve the purpose.

Manpower must be used intelligently and efficiently. Feather-bed practices by unions, stretching out of work, and strikes, along with hoarding of labor by management, must be put aside. They have no place in our war program.

American industry did a magnificent and precedent-shattering task of giving our boys what they should have in war equipment during 1943 and 1944. With the heat on again, there must be no let-up in operations until the day of final victory.

Winning the war must be our first order of business. By contrast with that assignment, nothing else matters.

Burnham Finney

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Photo Courtesy of R. G. LeTourneau, Inc.

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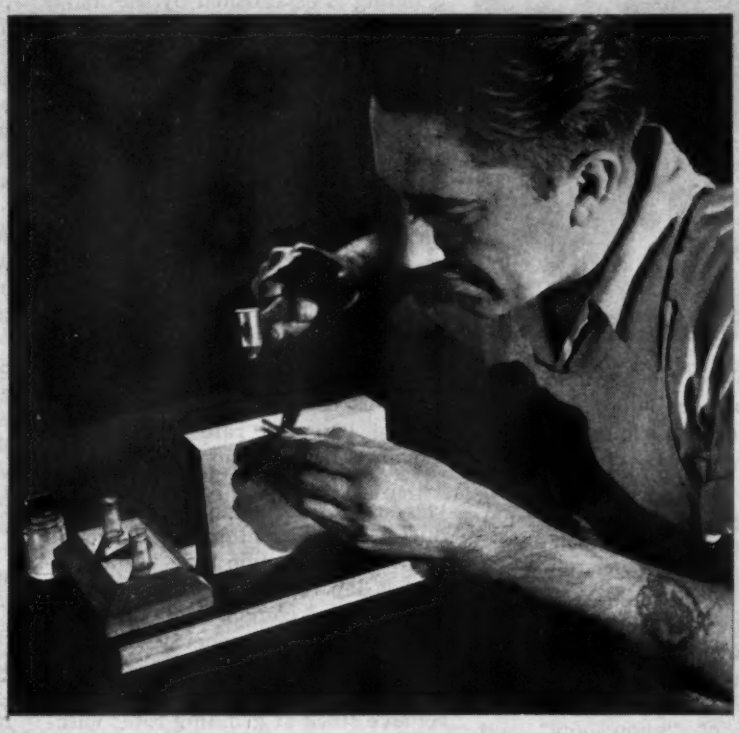


Proper technique for charging the mandrel is to hold it slightly above the hardened block lightly coated with oil and diamond dust; strike smart blows with a hardened hammer

Small-Hole Grinding WITH Diamond-Charged Mandrels

BY FREDERICK C. VICTORY, CHIEF ENGINEER, MOORE SPECIAL TOOL COMPANY, INC.

Round, straight holes in dies and gages can be produced to tenths faster with a mandrel charged with the proper grade of diamond dust than by use of small mounted wheels

DO YOU experience difficulty in grinding small holes with conventional abrasive wheels? If so, try using a diamond-charged mandrel instead.

A diamond-charged mandrel will increase the efficiency of stock removal in holes smaller than ¼-in. diameter, and makes possible the grinding of holes 0.030 in. or less in diameter, a condition unattainable with a conventional mounted wheel. The process is faster and cheaper than grinding with abrasive wheels or points for holes up to ¼ in. For holes above ¼ in. the mandrel would be too stiff for truing, and anyway the wheel is easily dressed and can be run at proper peripheral speed.

Application of diamond-charged mandrels may take two directions at least. First, in gage work, holes can be cleaned up to within 0.0002-0.0004 in. Then the grinding ridges are removed by lapping so that the gage possesses maximum wear quality when put into service. If gage

Besides achieving the exact location, a 0.150 in. hole was enlarged to 0.164 in. in 3 min.

holes were ground to final dimension, the ridges would soon be flattened by repeated insertion of a plug gage, and the accuracy of the gage would be lost. Second, in die work, the holes can be ground to final dimensions, because the grinding ridges serve to retain die pins.

Only lack of "know-how" and false cost impressions have limited acceptance of the method. This article, therefore, has a two-fold purpose:

1. To dispel confusion concerning correct terminology among those who use diamond-charged mandrels.

2. To point out the advantages and methods of grinding with diamond-charged mandrels for those who are not accustomed to using them.

The first thing to understand clearly is that "diamond-grinding", as discussed here, is not "diamond-lapping" and bears no relation to it. The terms of these two dissimilar operations are often used interchangeably, with resulting confusion of material specifications, equipment, design, and operational procedure.

Grinding vs. Lapping

The action of a grinding wheel can be compared with that of a multipoint boring tool; a lap, on the other hand, resembles a reamer in action. Several basic differences serve to establish a clear-cut demarcation between lapping and grinding of holes.

1. In lapping, the axis of the hole remains fixed since the lap itself is guided by the original hole. On the other hand, grinding permits the correction of hole location within any differential between the unground hole diameter and that of the finished hole. This can be accomplished by virtue of the fact that the axis of any hole generated by grinding is established by the major axis of the machine; that is, the axis of rotation of either the work or the grinding spindle assembly.

2. A grinding wheel is fed into the work to increase hole size by a movement outward from the major axis. The nearest approach to feed in lapping is the radial expansion of the lap itself to maintain its diameter relative to that of the hole. This is usually accomplished by driving the lap along the tapered shaft on which it is mounted.

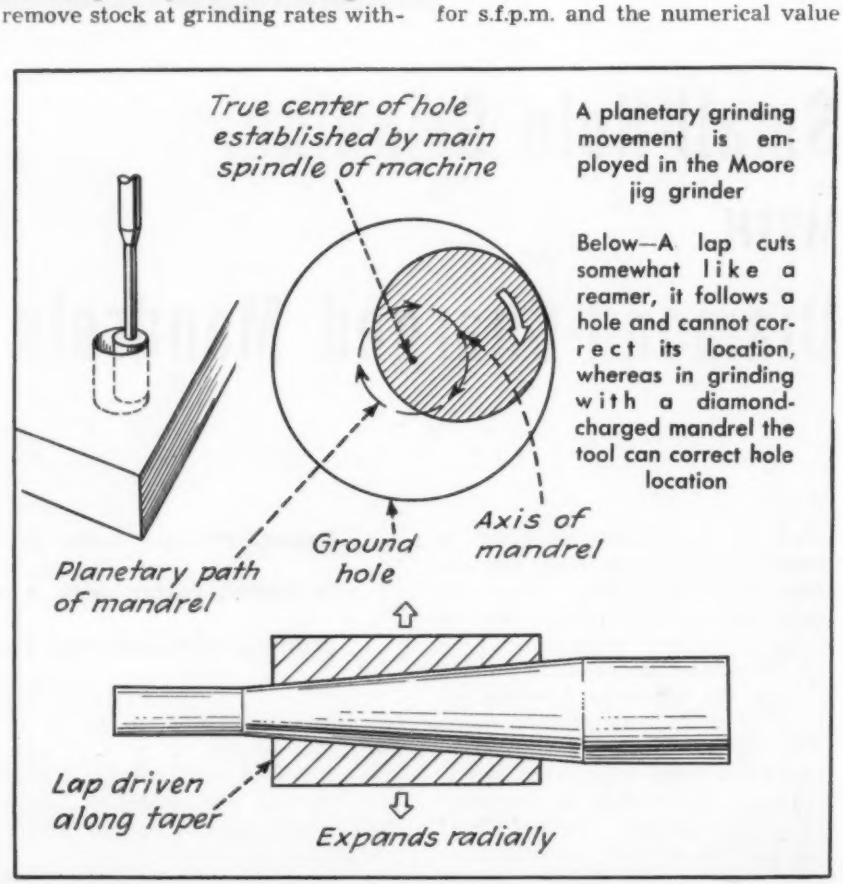
3. The surface speed of a grinding wheel is usually several times that of the lap, and rate of stock removal is proportionately higher. This is true because the partial contact area of the grinding wheel produces a far smaller total friction and heat generation than is the case with a lap having a continuous circumferential contact and high total friction and heat generation. Consequently, it is not possible to operate a lap at speeds fast enough to remove stock at grinding rates without severe overheating of the part.

The minimum limit in the size of holes that can be efficiently ground cannot be arbitrarily established without considering many limiting factors. Chief among these are the inability to provide a method of driving a grinding wheel at an efficient cutting speed, and the inherent weakness of abrasive wheels and mandrels at efficient speeds.

Engineering data issued by abrasive-wheel manufacturers give a widely varying range of peripheral wheel speeds for hole grinding—from 2,000 to 6,000 surface ft. per min. This range, of course, covers a number of modifying conditions such as grit, grade and bond of the wheel, rotational speed of the work or grinding head assembly and material being ground.

Tests conducted by the Moore Special Tool Company, Inc., on hole-grinding with its jig grinder indicate that the most efficient speed for small hole-grinding, with a suitable wheel, is the upper limit of the range, about 6,000 surface ft. per min.

Since the formula for peripheral speed is $\text{s.f.p.m.} = \frac{d \times \text{r.p.m.}}{12}$, this may be re-written as $\text{r.p.m.} = \frac{12 \times \text{s.f.p.m.}}{d}$. By substituting 6,000 for s.f.p.m. and the numerical value


True center of hole established by main spindle of machine
Axis of mandrel
Ground hole
Planetary path of mandrel
Lap driven along taper
Expands radially

A planetary grinding movement is employed in the Moore jig grinder

Below—A lap cuts somewhat like a reamer, it follows a hole and cannot correct its location, whereas in grinding with a diamond-charged mandrel the tool can correct hole location

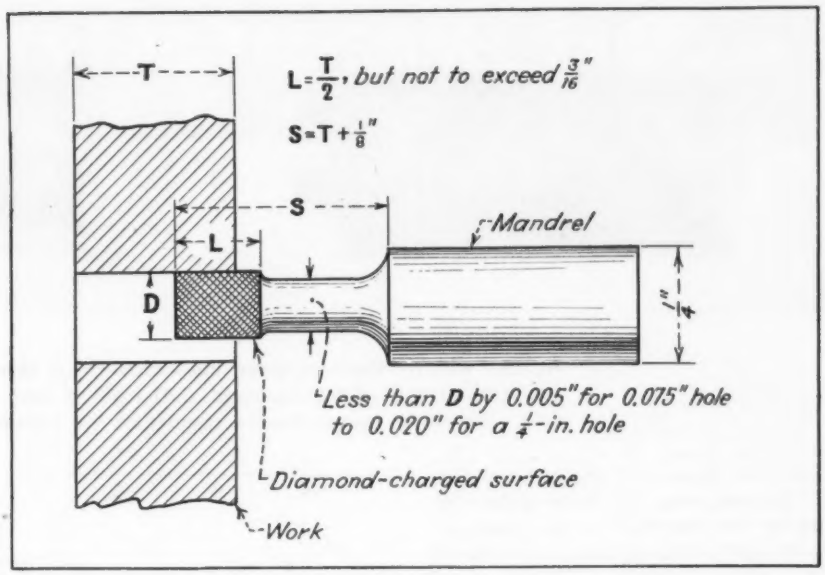
ror available r.p.m., the minimum wheel size that can be efficiently used can be determined for any given condition. For example if 75,000 r.p.m. is the available spindle speed, any wheel less than 9/32 in. diameter would be operating at reduced efficiency. As wheel diameter should be at least three-quarters of the hole diameter, this formula can be used for determining the relationship between hole size and wheel speed.

In most cases the critical-speed limit of small wheels (at which failure of abrasive or mandrel occurs) is reached before they approach an effective cutting speed. Although some degree of compensation for a deficiency in surface feet per minute can be made by increasing the "effective hardness" of the wheel, there is a limit in the possibility of compromise in this direction.

The solution to the problem is found in employment of a diamond-charged mandrel instead of an abrasive wheel for small holes. The advantages of this method lie in the reduced s.f.p.m. requirement (about one-fourth that of a grinding wheel), its greater rigidity due to its homogeneous structure, and the improved cutting action of diamond dust as an abrasive.

A general misconception prevails as to the cost of grinding with a diamond-charged mandrel. It is, in fact, more economical, both as to cost of preparation and unit cost of stock removed, than the mounted grinding wheel. The total cost is not more than 30 cents since a carat of diamond dust is sufficient for about thirty charges, and the time involved in turning the mandrel and charging it averages less than five minutes. A satisfactory dust containing sharp particles of uniform size should be obtainable for not more than $5 per carat.

The mandrel itself should be of dead soft cold-rolled steel turned to a suitable size and shape. The shank should be slightly undercut below the diameter of the surface to be charged and a good radius should be provided at the junction of undercut shank and the body of the mandrel. Length of the cutting surface should be approximately one-half that of the hole to be ground, but not to exceed 3/16 in. Do not attempt to grind holes with a depth more than six times the tool diameter; otherwise there will be trouble with correcting the hole.



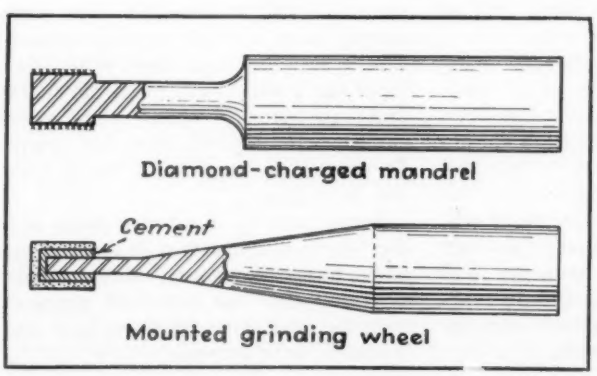
Experience with diamond-charged mandrels indicates that these proportions will give satisfactory results

The diameter of the mandrel is important. For a ¼-in. hole, the cutting section need not be more than 3/16 in. in diameter in order to obtain satisfactory stiffness. But with the smaller holes, the mandrel should be as large as possible, leaving only sufficient clearance to permit straightening the mandrel so that it runs true. In such cases an operator can easily judge whether the mandrel is running true within 0.001-0.002 in. If after straightening the mandrel and taking a few passes, he is still of the opinion that the mandrel is not running true, the tool is run out of the hole, and a hammer tap is made on the side opposite the shiny streak. This streak arises because it is improbable that the complete circumference of the charged section will come into contact with the hole.

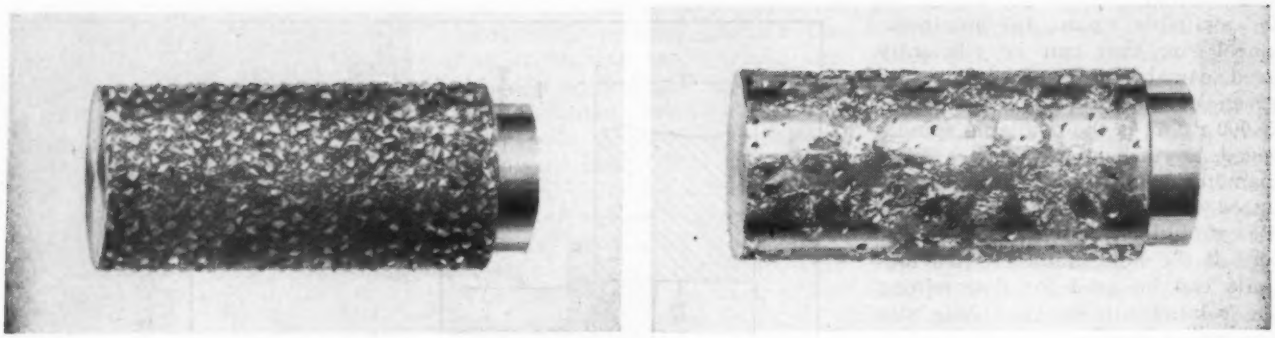
The appearance of the mandrel after use provides no reliable indication of cutting efficiency. When first charged, the mandrel has a surface that appears to be covered with a gray powder. After use it may be dull or shiny, and a strong magnifying glass will be needed to see the sharp cutting points embedded in the surface. The only true measure of cutting efficiency is whether the cutting action keeps pace with the feed.

The term "charge" is used in order to differentiate from "impregnation," a term which implies a uniform distribution throughout the mass, whereas in preparing the mandrel the diamond particles are driven in from the surface.

It is important to use the correct size of diamond particles. Diamond dust supplied for lapping is entirely unsuited to use with charged mandrels. The latter require diamond particles which are approximately six times larger, are sharp and uniformly graded. A "coarse grade," of 60-80 grit should be used for roughing operations on holes of 3/32 in. diameter or larger. A finer grade, 80-100 grit, is required for finishing mandrels to cover this range, and is employed for both roughing and finishing operations on



Stiffness of the diamond-charged mandrel is greater than the mandrel of a mounted wheel, hence the former can be used at its optimum cutting speed, which is 1500 s.f.p.m when diamond grinding



As seen with a 10-power glass, the surface of a new mandrel (left) is well coated with sharp diamonds. At right is seen a mandrel after use. The white streak reveals contact of the mandrel with the hole

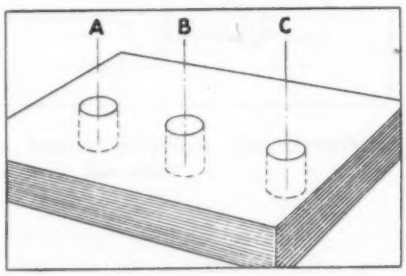
holes less than 3/32 in. in diameter.

Charging may be done either by rolling the surface to be charged, under pressure, against a hardened steel plate covered with diamond dust, or by hammering.

The latter has proved to be the more satisfactory method. A small quantity of diamond dust is placed on a hardened steel (Rockwell C 65) plate moistened with light oil and the surface to be charged is placed in the dust and tapped sharply with a small hammer, also hardened to Rockwell C 63-65. During the operation, the mandrel is turned slightly to expose its entire surface to the dust. It is good practice to hold the mandrel about ⅛ in. from the block, so that diamond particles are driven into both sides of mandrel. This firmly embeds the particles without the crushing or pulverizing effect found when the surface is rolled between two plates. After being charged, the mandrel should be dipped in acetone to remove any oil which might adhere to its surface.

Contrary to prevailing opinion, olive oil or other lubricants should not be used when diamond grinding. Because of the high rotational speed, these substances tend to promote glazing and loading up. The practice employed by Moore is to keep the surface of both the mandrel and the hole clean and dry during grinding. This is done by frequent cleaning, using a pipe cleaner dipped in acetone.

Unlike a grinding wheel, the charged mandrel emits no sparks while grinding. For this reason it is sometimes difficult to ascertain the exact moment of contact when feeding into the work. To overcome this, Moore has developed an electronic amplifier for use with the jig grinder, which makes this contact audible. The amplifier has been of value in training operators.



Proper method of grinding three holes in a die block is to grind holes A and B first within 0.0001-0.0002 in. and then hole C within 0.0005 in. Take a new mandrel and finish C, thereby breaking down the high points on the tool, after which it is safe to finish A and B without cutting oversize

During grinding the best results are obtained, both as to rate of stock removal and life of the charged surface, if a constant pressure is maintained between the mandrel and the work. Experience has shown that this amounts to about four or five ten-thousandths lead of the feed over the cut until the hole nears size. This can be judged by the apparent rate at which the mandrel cuts, and generally an increase in feed of two or three "tenths" per stroke will maintain this ratio. Never let the mandrel run out at both ends of the hole; work the tight end of the hole by further run out.

Obviously a freshly charged mandrel will remove stock at a much faster rate than one which has been used for some time. Caution should be used in re-charging a mandrel just as a hole approaches size, because the rate of stock removal will increase greatly over that of a worn mandrel. Failure to consider this factor often results in grinding oversize before the mandrel can be withdrawn from the hole.

The following typical Moore jig grinder procedure is currently employed in the case of three or more holes of a similar size:

Starting with a freshly charged mandrel, two holes are brought within one or two "tenths" of size. By this time the diamond particles have been dulled and broken down to a uniform surface which cuts somewhat more slowly but produces a better finish. The third hole is now purposely ground four or five "tenths" under size. After recharging the now worn mandrel, the third hole is brought up to size, which takes the high points off the charged surface and reduces it to a uniform cutting surface before the last tenth is removed. This minimizes the danger of using a fast-cutting mandrel in holes as close to size as the first two. The grinding rate of the mandrel will now remain constant for a considerable time and the first two holes can be safely brought up to size.

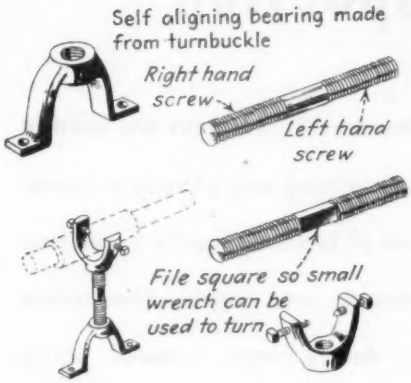
This technique is particularly adaptable to the Moore jig grinder because of the rapidity and accuracy with which the holes can be located in position for grinding. In the case of an internal grinder this is not possible, but in bringing each hole to size care should be exercised not to use a freshly charged mandrel when a hole nears size.

Do not permit the uncharged shank of the mandrel to come into contact with the hole by any chance. The fractional heat that will arise from the contact will burn the work and the mandrel. The work then can absorb diamond dust, and it will be practically impossible to reclaim the workpiece.

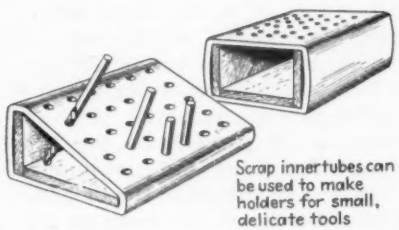
Sometimes the jig-bored holes in a die block will contain scale and oil after heat-treatment. Make a pass or two with the diamond charged mandrel and then clean the hole and mandrel with acetone.

SHORT CUTS FOR THE SMALL SHOP

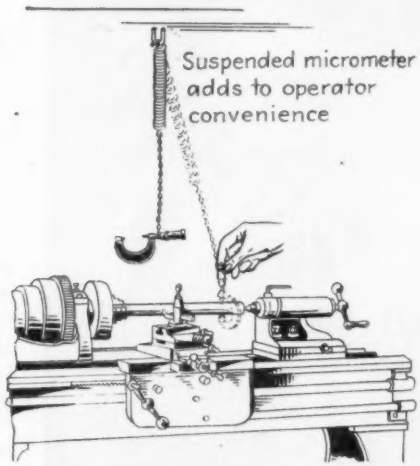
BY A. H. WAYCHOFF


Self aligning bearing made from turnbuckle
Right hand screw
Left hand screw
File square so small wrench can be used to turn

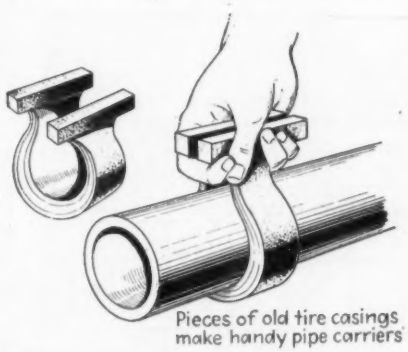
SELF-ALIGNING shaft bearings can be made from old turnbuckles. A typical one was made in this manner: A turnbuckle, fitted with ½-in. rods, was chosen, the rods removed and the body cut in half. The rods were then cut so only about ⅜ in. of unthreaded portion remained on each. The unthreaded ends were welded together, and a square filed at the center for wrench flats. On the half of the buckle which was to be used as a base, the ends were bent outward to form legs. Holes were then drilled in the legs for attaching the device to a bench. In the other half of the buckle, a hole was drilled and tapped in each leg to take ¼-in. setscrews to hold the bearing. To assemble, the right- and left-hand threads are properly fitted in the two buckle halves. The height is then easily adjusted by using a wrench. For bearings ½- or ⅜-in. pipe couplings can be used, lining them with babbitt or bronze.



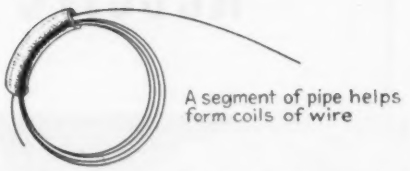
TOOLHOLDERS for small, delicate tools can be made from rubber innertubes which otherwise have outlived their usefulness. They can be made in two shapes by making either a trough or an angle from light lumber. When the boards are joined in the desired shape, a piece of tube of equal length is stretched over the form. Finally, many small holes are punched through the rubber, smaller than the tools to be held. Troughs should be about half as deep as the length of tools, and the wooden forms should be of such size as to make necessary stretching the rubber to make it fit. Tension thus created will cause the tools to stand straight in the holder.



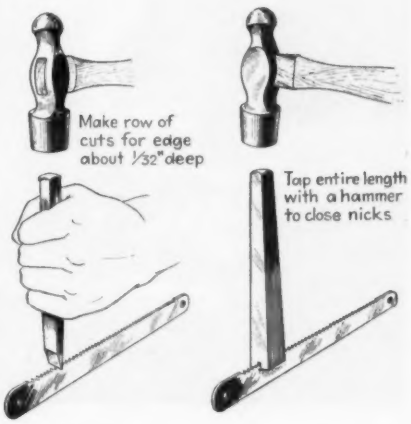
MICROMETERS and calipers suspended above a lathe add to operator convenience and reduce the likelihood of damage to measuring instruments from dropping. One machinist took a light screen door spring, attached it to a ceiling joist and added a suitable length of light chain, to which was fastened a small harness snap. Wire rings were then fastened to the measuring instruments so they could be quickly attached to the hanging support. In use, the micrometer or caliper is grabbed by the operator as needed and then merely released when he is through. The spring pulls up the instrument.



PIPE CARRIERS find many uses around most shops. Simple carriers that are serviceable can be made from old tire casings. After a piece of casing has been cut to proper length, it is shaped to form a T-handle on each end, as shown. In use, the carrier is merely slipped over the end of the pipe or shaft and gripped in one hand.

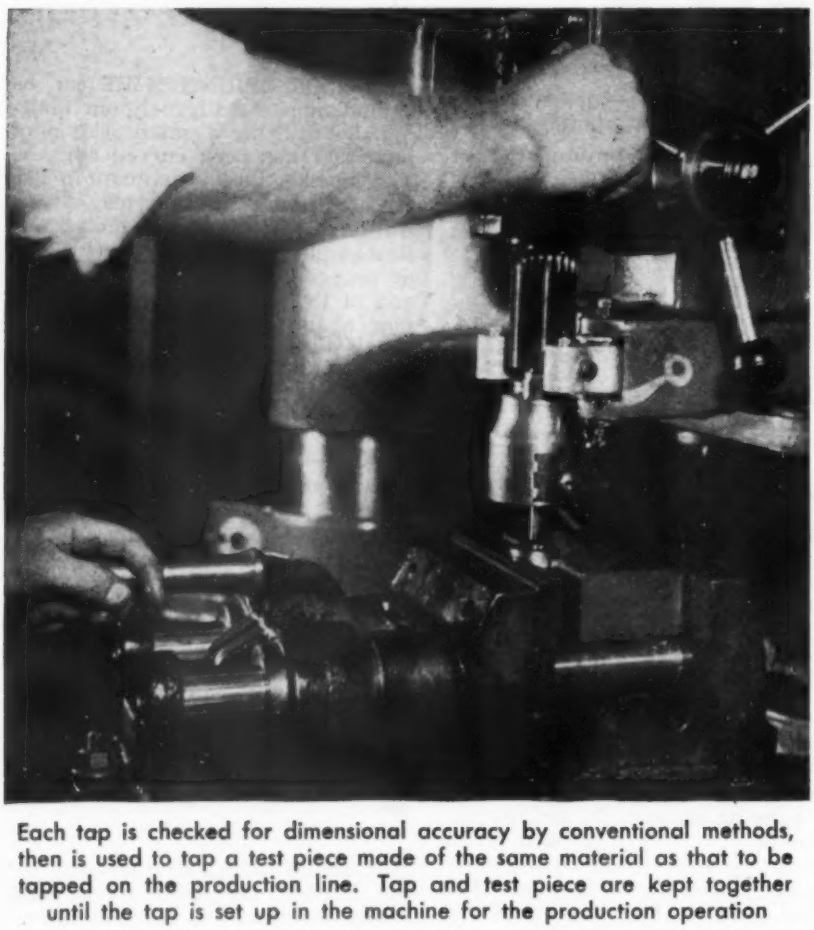


STEEL OR SPRING WIRE can be wound more readily, without kinking, by utilizing a small section of pipe that has been curved slightly. The pipe should approximate in size and curvature one-quarter of the coil to be wound. To use, the wire is started through the pipe until a loop of proper size is formed, then the end of the wire is put through the pipe again. To add more wire, the coil is turned with one hand.



HACKSAW BLADES that will cut the hardest tempered steels, gem stones and glass can be made in any shop. First, a piece of soft iron, similar in size and shape to a standard hacksaw blade is formed. Holding the blade on edge, a series of slanting nicks are cut, about 1/16 in. apart, with a fine-edged chisel. The nicks should be about 1/32 in. deep. Next make a tool with a 1-in. slot, 1/16 in. deep, and 1/16 in. wide. A small quantity of diamond bortz is carefully dusted into the nicks in the blade. After the nicks have been filled, the closing tool is used by setting the groove on the edge of the blade and tapping it lightly with a hammer, so the nicks are closed over the diamond dust. This completes the blade and it can be used in any hacksaw frame. With this blade, a mixture of lubricating oil and kerosene as a lubricant will add to its service life. While a soft iron is desirable, this tool can be made from ordinary cold-rolled steel, and it should be possible to charge both edges for longer cutting life.

New and Resharpened Taps Receive Laboratory Inspection



Each tap is checked for dimensional accuracy by conventional methods, then is used to tap a test piece made of the same material as that to be tapped on the production line. Tap and test piece are kept together until the tap is set up in the machine for the production operation

Tap Description: 10-32 Tap- Com. Ground 3 Flutes Bottom (for Mag.)

Tap No. 417562-T-14

CODE
Parts Tapped With Lead Screw - A
Parts Tapped With Tapping Head Without Lead Screw - B
Parts Hand Tapped (2 Operations) - O

Part Number	Code	Oper. No.	Gage Pitch Dia.	Gage Number	Material Spec.	Lub. Used	Body Hole Size	Tapped Holes Per Day	Est. 60 Days Supply	Test Block Number
417562	A	90	.1697 .1734	416209-G-1	MAG.	Kero'ne Lard Oil	.159 .162	2960	900	M-1

Each standard and special tap used in the shop is checked against data shown on cards like the one above. The test block to be used for the tapping test is specified, as is the type of material to be tapped, the cutting fluid to be used and the diameter of the tap drill

Standard test pieces are used in determining acceptance or rejection of taps. Complete inspection records are kept. Elimination of faulty taps reduces scrap

TAPS used for production operations in the Dodge Chicago Plant, division of Chrysler Corporation, are inspected carefully to insure that each tap is correct before it is put on the job. The high quality of work required on the 18-cylinder Wright Cyclone 2,200 hp. radial engines being made in volume for the Boeing B-29 and the Consolidated B-32 bombers makes tap inspection essential if the production schedule is to be met and part rejections are to be held to a minimum.

All taps are checked in a laboratory which is equipped to inspect as many as 5,000 taps a day. This laboratory has all of the necessary equipment for the usual dimensional gaging of taps, including optical comparators, accurate electric-type comparator gages and similar equipment. In addition, tapping machines are present so that test sample pieces can be tapped with each tool before acceptance for production use.

The practice of using a test sample for each tap assures set-up men and inspectors in the production department that taps meet specifications. It is conservatively estimated that approximately 10 percent of the taps purchased, and about an equal number of the taps resharpened in the toolroom have errors or burrs that must be corrected before they will produce threads in holes to accurate dimensions.

Burrs on the cutting edges, formed when the flutes are ground, cause a tap to cut oversize. This is one of the most common errors found in laboratory inspection of new taps and resharpened taps. Other inaccuracies commonly found are lead and angle errors, eccentricity of the body of the tap with the pitch line, eccentric chamfers, and taps slightly over the maximum tolerances.

A standard data card is filed in the tap inspection laboratory for each size and type of tap. These cards indicate the number of the part to be tapped; the size of the tap; the material to be tapped; the cutting fluid to be used; whether tapping is to be done with a leadscrew or not; the body hole size; and the pitch diameter to be held. Also recorded on this card is the style number of the test block sample used before taps are approved for actual shop work.

These test blocks or "slugs," as they are known in the laboratory, are made up on a turret lathe in the tap inspection laboratory according to standards developed for each size and type of tap, and for each material to be tapped. The test block always is made from the same material on which the tap will be used on production, and is usually cylindrical in shape, with a body diameter of sufficient size to prevent distortion when the tap is run through the hole in the center of the cylinder. Generally, the slugs have a length equal to 1½ times the diameter of the tap.

The tap inspection laboratory keeps complete records of each lot of taps inspected. Only those taps accepted for production can be moved to the crib for marking and for delivery to the shop. A rejection ticket is attached to each lot of taps turned down. These tickets have spaces to indicate disposition of rejected tools, and the reasons for rejection.

Of special importance in the tap inspection program is the fact that the test blank accompanies the tap from the laboratory to the marking crib and then to the production floor. The sample is inspected in the laboratory to make sure it meets size requirements, and then it is inspected again by the set-up men and the floor inspectors before the tap is put in position in a machine. Sample blocks are scrapped after acceptance by the floor inspector. This inspection plan has eliminated loss of much time previously spent in trying out "green" taps before a production set-up started operations.

Form D.C. 491

DODGE CHICAGO PLANT
DIV. OF CHRYSLER CORP.

Part No.

Tool Inspection Report

Vendor

Tool Name

Part Name

Date Received | Date Inspected | Order No.

No. Accepted | No. Rejected | Div.

REMARKS:

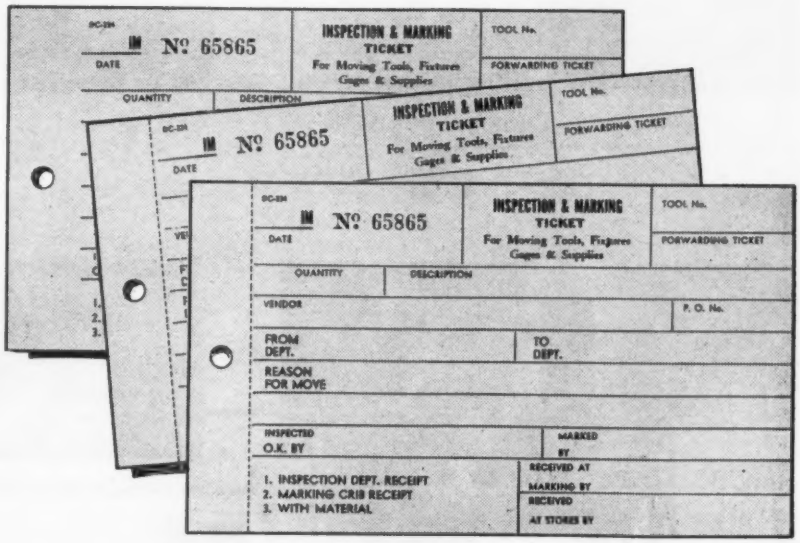
Return To Vendor | Correction | Our

Alter Design | Credit | Expense

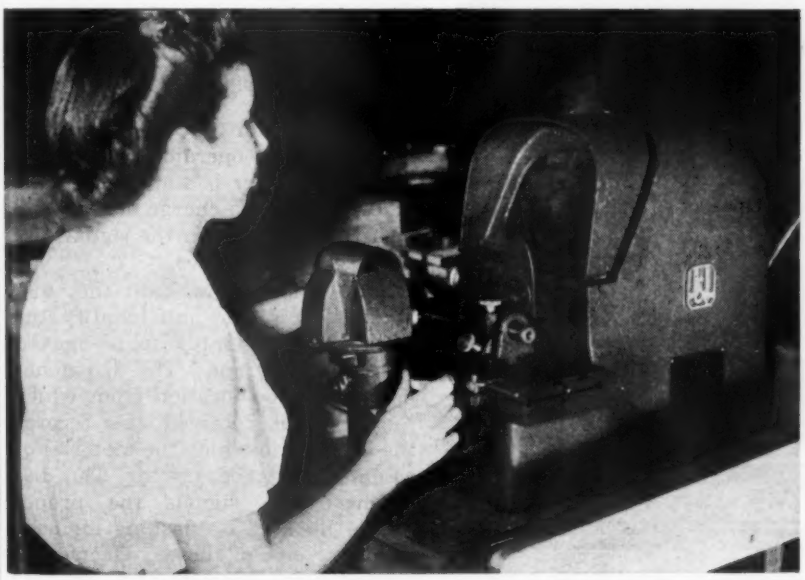
Send to Dept. | Est. No. Hours | Replacement | Their

Inspector | Approved

For each lot of taps inspected, a tool inspection report form is used to record necessary data about the taps accepted and those rejected



Accepted taps are identified with blue tags, made out in triplicate. The original copy is returned to the inspection office after it has been signed by the marking crib attendant. The second copy is retained by the marking crib after it has been signed by the tool stores crib attendant. Third copy remains with the tools for identification



Optical and mechanical comparators, as well as other measuring devices, are used in the tap inspection laboratory for checking the dimensional accuracy of both new and resharpened taps

Electric Signal Boards Coordinate Crane Operations

BY EMIL J. RIDDER, ASSISTANT FOREMAN OF OVERHEAD CRANES, WICHITA DIVISION, BOEING AIRPLANE COMPANY

Nerve center of the crane dispatching system is on a balcony high above the factory floor. Crane floor men, or "hookers," are signalled by flashing proper code numbers on a large electrically lighted board, then move orders are transmitted by telehone

Crane movement of materials and heavy subassemblies for the B-29 Superfortress is controlled by a signal dispatching system

CENTRALIZED dispatching of the six heavy-duty, overhead cranes which serve the primary and final assembly areas of the huge plant of the Wichita Division of the Boeing Airplane Company is necessary to insure coordination of assembly operations on the B-29 Superfortress. A planned schedule for crane operation has spared production lines from "getting out of time," with consequent delays. By programming all production lifts, overhead electric cranes are used most efficiently and prompt attention can be given to emergency lifts when necessary.

A large electric signal board placed above a small balcony high above the factory floor is the nerve center of the crane dispatching system. Three key individuals control the operations: The crane operator, the dispatcher, and the floor man or "hooker." The latter wears a red cap so he can be easily spotted from the crane operator's cage. The crane dispatcher is stationed on the balcony and is in charge of a control board through which the signal dispatch system operates.

Shop supervisors call the dispatcher by phone and identify the material or assembly to be moved by overhead crane. The dispatcher notes the shop location from which the call was received and records the location to which the material or assembly is to be moved. The dispatcher then signals the proper crane "hooker" by flashing his code number on a large electrically lighted board, visible from any part of the production floor. One electric signal board serves the primary assembly area and other boards are

Fuselage sections for the B-29 bomber are moved about the primary assembly area with 5-ton capacity overhead cranes such as the ones shown. Four 10-ton capacity cranes of similar design serve the larger final assembly areas. Because of plant noise, lift instructions can be given the crane operators only by hand signals or by telephone

used for each of the larger final assembly areas.

When the "hooker" sees his code number on the signal board, he calls the dispatcher, receives the necessary move instructions, and then signals the crane operator to proceed to the proper location. If the job requires special instructions, the crane operator can lower a telephone line from the crane control cage for a person-to-person talk.

If the move is merely a routine job, the dispatcher summons the crane hooker with a white light. A red signal means a "rush" or "expedite" assignment. If the hooker sees his red number blinking rapidly, he calls the dispatcher immediately because it means all previous instructions are cancelled or an emergency has arisen.

Two five-ton capacity electric overhead cranes serve the primary assembly area where the major fuselage assemblies for the B-29 Superfortresses are completed. These cranes are suspended from 200-ft. long bridges. There are two final assembly areas where the major subassemblies are put together to form the bomber. Two ten-ton electric cranes service each of the two final assembly areas. The crane bridges extend 300 ft., and each bridge can be split into two sections, if necessary, thus leaving one-half idle while the other half is in use.

In each final assembly area, the two ten-ton cranes can be joined mechanically and electrically for combined operation in lifting the 17-ton center wing assembly for mating with the bomb-bay assembly.

The importance of swift and efficient crane operation in meeting production demands for the warplanes cannot be over-emphasized.

Rubber Sheets for Stretch Press Dies

BY RUSSELL P. KEMP, DOUGLAS AIRCRAFT COMPANY

STRETCH PRESS operations on sheet metal required a coating of grease on the stretching die. The grease was removed after each operation by a degreasing fluid and the die regreased, all of which took considerable time.

A method employing a sheet of rubber was substituted for the greasing procedure followed formerly and the over-all time for the operation has been greatly reduced. The substitution has saved 8 barrels of grease, 159 gallons of degreasing fluid and 3,000 man-hours per month.

Sub-Zero Treatment of Steel Increases Hardness and Stability

BY CHARLES M. PARKER, SECRETARY, GENERAL TECHNICAL COMMITTEE, AMERICAN IRON AND STEEL INSTITUTE

A three to six-fold increase in pieces per grind is reported for high-speed steel tools subjected to cold treatment. What happens to the internal structure of the metal to bring about such worthwhile results is explained here

THE ART of heat-treating steel is based upon the fact that by the application of the appropriate amount of heat the internal structure of the metal can be materially changed and the changes controlled with a high degree of precision while it is in the solid state.

For many years it was thought that all changes in internal structure ceased at atmospheric or "room" temperature. Today we know that is not true and sub-zero temperatures are being used in connection with conventional heat-treatment cycles to produce stronger, harder, more efficient steels. Low-temperature treatments are also helping the toolmaker to secure greater dimensional stability and greater precision in his products.

The three ultimate results of sub-zero treatment—greater hardness, greater dimensional stability, and greater dimensional precision—are closely related and are a result of the phase changes which are responsible for the transformations which take place in the crystalline microstructure of steel. Those transformations really occur in the atomic structure of the metal; the microstructure is simply a visual expression of the specific internal structure or grouping of atoms. Thus, it may be well to review the pertinent facts concerning the internal structure of steel, and what happens when it is heat-treated in the conventional manner. We can then advance a theory as to what happens when sub-zero temperatures are employed.

The changes which take place in the internal structure of steel, upon which the science of physical metallurgy is founded, are transformation of austenite to martensite, and subsequent transformation of relatively unstable martensite to tougher and softer spheroidal constituents. From the iron-carbon diagram, it is seen that all steels are austenitic above a certain temperature peculiar to each chemical composition, provided sufficient time has been allowed for the solution of carbides to become complete. In ordinary kinds of steel, austenite is unstable below the indicated temperatures; that is, it can easily be transformed by lowering the temperature.

In the ordinary processes employed in heat-treating steel, the austenitic structure is transformed to martensite on quenching, and the martensite is softened and converted to a spheroidal constituent in the tempering operation. Theoretically, each transformation should go 100 percent to completion in all kinds of heat-treatable steels, but practically that does not happen. Frequently, there remains after quenching some quantity of retained austenite—some that was not transformed. And even after tempering certain kinds of steel some of the retained austenite remains. Double tempering is sometimes performed in an effort to lessen the quantities of untransformed structures.

Before discussing results obtained by sub-zero treatment and the manner in which it is thought those results are achieved, it may be well to explain briefly some of the outstanding characteristics of the various components of the microstructure of steel, and describe some of the atomic changes which it is thought take place during the heat-treatment cycle.

Austenite is a solid solution of carbides in a kind of iron which is in an unstable structural form. The iron is known as the gamma form, stable from 2550 F. to 1670 F. (when pure) and X-ray analysis shows that the atomic arrangement is a face-centered cube. Below 1670 F. the atomic arrangement becomes a body-centered cube, and the material is called alpha iron. The maximum solubility of carbon in gamma iron is 1.70 per cent by weight; in alpha iron it is only 0.035 per cent.

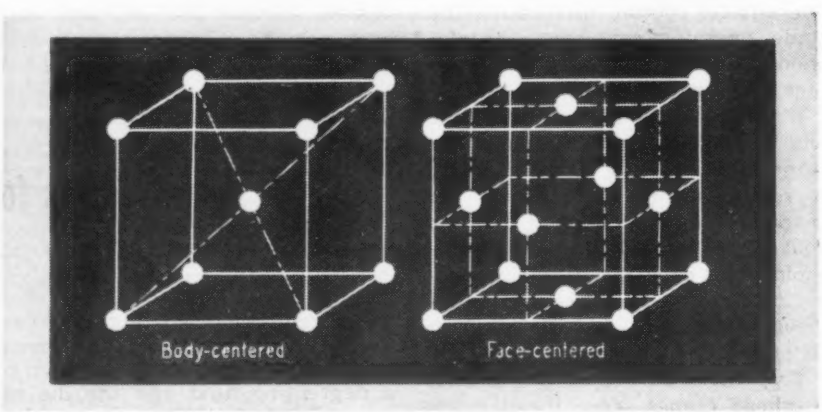


Fig. 1—Lattice structures of alpha iron (left) and gamma iron (right) show the idealized arrangement of the iron atoms

The space lattices, or the idealized arrangements of iron atoms in the gamma and alpha forms of iron, are shown in Fig. 1.

Ferrite is the metallurgical name for pure alpha iron and for alpha iron in which manganese, nickel and silicon have been dissolved. The ferrite of all commercial steels contains at least a trace of carbon. When the metals referred to dissolve in iron, they form what is known as a substitutional solid solution because they replace an atom in the space lattice of alpha iron as shown in Fig. 2.

Carbides are solid solutions in which carbon combines with some other element such as iron, manganese, chromium, molybdenum or tungsten. The carbides differ from ferrite in that they are what is known as interstitial solid solutions; that is, the carbon atoms do not replace atoms in the space lattice of the metals, but somehow arrange themselves in between the metal atoms on a lattice of their own, as shown in Fig. 3.

The principal carbide found in steel is cementite, the carbide of iron and carbon. In solid form cementite generally exists in plate-like masses distributed throughout the ferrite matrix, although it may also exist in globular or spheroidal form. Manganese and chromium can replace some of the iron in cementite to form a special kind of double carbide.

Expansion of Atomic Structure

When carbon and the other elements which form cementite dissolve in gamma iron to form austenite, an atomic rearrangement takes place such that all the iron atoms locate themselves on a face-centered cubic lattice, while the carbon atoms disperse themselves in between the iron atoms but not on the same lattice. The addition of the carbon atoms causes the austenite lattice to expand. This is significant because carbon atoms are much smaller than iron atoms, only 57 percent as large, and is conclusive proof that the carbon atoms have not replaced iron atoms in the lattice; if they had, the austenite cell size would have decreased.

That fact leads to the conclusion that the carbon atoms are at the center and mid-points of the edges of the lattice, as shown in the left-hand diagram of Fig. 3. The amount of carbon present in engineering steels and most tool steels is never sufficient to permit each position to be occupied by a carbon atom.

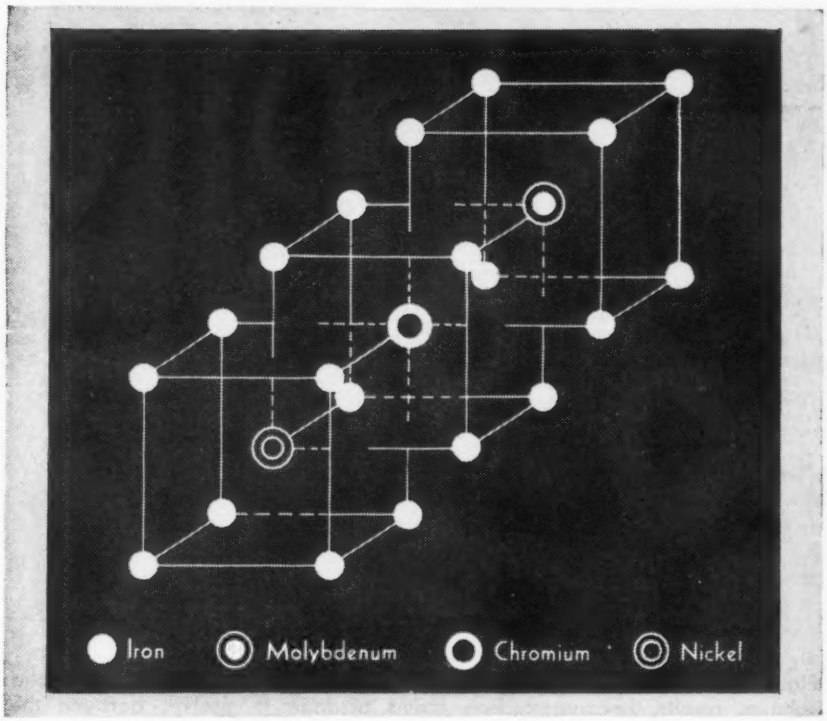


Fig. 2—Atoms of carbon and various alloying elements may dissolve in alpha iron, or ferrite, by what is known as substitutional solid solution, and replace an iron atom in the space lattice

When the hot austenite is quenched, the gamma iron is transformed to alpha iron so rapidly that the carbon does not have an opportunity to combine with iron or other carbide-forming elements. Much of the carbon is rejected, that is, thrown out of solution in molecular-sized particles, and tends to be uniformly distributed throughout the matrix. Those particles do not occupy any ordered arrangement in the space lattice of alpha iron, since its maximum carbon solubility is only 0.035 per cent, and they distort the iron lattice because they exist outside it and between atoms which are in the lattices of individual crystals. This causes an increase in volume and the steel swells. The volume of martensite is the greatest of any of the microstructures.

Some of the carbon which has been rejected by the gamma iron may, in certain types of steel, form cementite, but that reaction is not instantaneous and because a small amount of material is involved it does not cause any visible change in microstructure. In combining with carbide-forming elements, the carbon atoms occupy an ordered arrangement, and therefore the steel shrinks. The unit lattice of cementite contains 12 iron atoms and four carbon atoms, while the austenite lattice contains one carbon atom and eleven iron atoms.

The foregoing simple explanation of heat-treatment operations is based on the traditional principle of stopping the treatments at room temperature. The newer idea is to continue the treatments to sub-zero temperatures in an endeavor to promote further transformation in those types of steel in which retained austenite is most likely to be found. Among those types are high carbon steels, steels containing nickel in excess of 1 percent, and steels containing more than 0.90 percent manganese.

Aids Transformation

The idea of using sub-zero temperatures is based on the fact that in cooling steel rapidly internal stresses are set up which prevent the transformation going to completion.

The relief of those stresses accounts partially for the phenomenon of age-hardening; that is, the transformation proceeds toward completion and finally reaches stability over a period of time ranging from weeks to years. Now, if the steel, as a part of the heat-treatment cycle, is progressively subjected to sub-zero temperatures in a continuous reaction, the aging phenomenon takes place in a few minutes, or at most in a few hours. If the steel is not subjected to the lower temperature as a continuous part of the

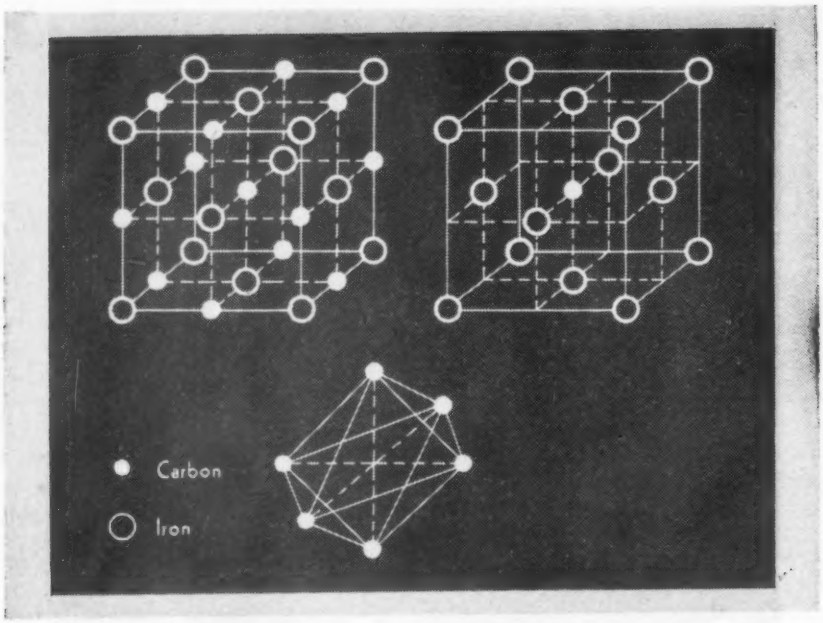


Fig. 3—(Left) If carbon combines with another element, an interstitial solid solution results, because carbon atoms arrange themselves between the metal atoms in a lattice of their own. (Right) Carbon content of steels is insufficient for carbon atoms to occupy each center or midpoint of the lattice; in practice only one of twelve possible positions is so occupied. (Below) A possible unit lattice of carbon atoms

temperature cycle, no benefit is had, and aging proceeds on its normal long-time course.

Because austenite has smaller volume per unit weight than martensite or pearlite, any reduction in the quantity of austenite retained in a normally martensitic or pearlitic matrix promotes greater dimensional accuracy at normal temperatures. This is true because steel products of the types under consideration are designed for use with pearlitic (spheroidal) structures which have been derived from martensite, and because the reactions have gone as far towards completion as possible (reached stable equilibrium) so that dimensional stability at normal temperatures is assured. Moreover, since austenite is the softest structure, reduction of that component promotes hardness by increasing the amount of pearlite present.

An example of this latter condition is given by an experiment conducted on a 0.95 percent carbon, 5 percent nickel steel. After oil quenching from 1300 F. the steel had a Vickers hardness of 752 and examination showed 38 percent retained austenite. After one hour in liquid air the Vickers hardness had increased to 810 and the retained austenite had dropped to 19 percent.

The fact that the steel changes dimensionally during the austenite-martensite and martensite-pearlite transformations establishes an important reason why sub-zero temperatures should be employed as a continuous part of the heat-treatment cycle. The continuously falling temperature sets up mechanical stresses which assist the carbon atoms to enter the iron lattice.

If only a small percentage of carbon atoms enter the alpha iron lattice, differential volumetric changes occur which cause non-uniform shrinkage and consequent cracking. It is for that reason that a conventional tempering operation or a sub-zero treatment should be performed as promptly as possible after quenching in order to produce a stable pearlitic (or tempered martensitic) structure.

Cementite is derived from martensite, the body-centered cubic structure, at considerably lower temperatures than from austenite, the face-centered structure. Thus, the relative positions of the iron and carbon atoms in martensite are especially favorable for transformation with comparatively small atomic movements at low temperatures. The martensitic structure is actually a body-centered tetragon with carbon atoms situated at the center of the square faces of the lattice.

The cementite structure is derived from the martensitic structure by entrance of a relatively large quantity of carbon atoms into the alpha-iron lattice and by reason of shear forces (relief of stresses) which return the alpha iron to a cubic lattice instead of a tetragonal one. Because the *carbon atoms enter the iron lattice* they occupy less volume than they did when they were distributed at random and stresses are relieved which were set up when they occupied unordered positions in the matrix.

The relief of existing stresses is borne out by the increase in toughness and ductility which the tempered steel exhibits over steel in the martensitic condition.

More Experience Needed

But once again, these reactions do not always go to completion in all steels. Some austenite may be retained, particularly at the lower tempering temperatures. If that is true, the aging phenomenon occurs and the steel changes in dimensions and hardness values. If the steel is refrigerated as a part of the tempering cycle the reactions continue farther toward completion and a consequent stable structure which insures stable hardness and stable dimensions. As experience is gained with sub-zero treatments and correct allowances are made for changes in hardness and dimensions, greater precision becomes possible.

Small Hose Strangles Pneumatic Power

BY W. O. DOWNS

A PNEUMATIC TOOL cannot operate efficiently unless supplied with sufficient air by means of the right size hose.

An efficiency engineer noticed two operators attempting to ream burrs from the inside of a 3-in. tube. These burrs occur when electric butt-welding two such tubes together. The proper size reamer and the proper size portable pneumatic tool were being used, but insufficient power was created properly to do the work.

When the efficiency man saw the ½ in. dia. hose attached to the air receiving end of the machine, he arranged for the substitution of a 1½-in. hose. Thereafter the work was correctly performed. The increased diameter of hose permitted approximately nine times the amount of air to enter the machine in the same given time at the same pressure per square inch.

Preventive Maintenance Program Keeps Equipment in Good Order

Trained maintenance men make repairs and perform emergency work under the system developed by Eastman Kodak Company. The repair crews check equipment regularly

SOME TIME AGO, the power plant feeding the Hawk-Eye works of Eastman Kodak was suddenly shut down. This resulted in grave hazards throughout the plant. For example, gas compressors had to have their valves turned off or a serious explosion might have resulted. Electric furnaces and motorized air-conditioning had to be shut down. Electric automatic stokers were put out of commission, so that certain furnaces had to be stoked by hand. Elevators were caught between floors and had to be pulled up by hand.

In one of its electric refrigerators, Hawk-Eye had some highly explosive chemicals which would ignite spontaneously should they be allowed to reach room temperature. In order that as little damage as possible would occur in the event of an explosion, maintenance men were assigned to carry the chemicals to a vacant lot nearby.

These tasks would have been difficult enough in daylight, but as this happened at night, the maintenance men had only the help of a few flashlights. If it had not been for the organization of the maintenance system, many people might have been killed and injured. Moreover, the efficiency of the system was so highly developed that, within an hour after the electricity had been turned on again, the plant was functioning as smoothly as it had been before.

This incident is cited as an example of what can be accomplished by trained maintenance men in an emergency. But Kodak's system of "preventive" maintenance minimizes breakdowns of equipment, and permits swift repair and emergency work when the necessity arises.

At Kodak plants, there is an expert mechanic for each type of equipment, whether it be a punch press or a typewriter. He is scheduled to check each machine daily, weekly, monthly, or yearly depending upon the type of machine and the amount of use it receives.

Kodak believes that the organization of its maintenance crews is at its peak efficiency.

At Kodak Park, which has 100 buildings covering 400 acres, Eastman has more than 1,000 men in maintenance and construction, most of whom are divided up into ten field gangs, each in charge of a foreman. Each gang is responsible for one of the ten zones into which the plant is divided. Each has its own fully equipped shops, such as machine shop, electric shop, carpentry shop, and sheet metal shop. This enables the men, who are specialists in their own field, to do most kinds of work in their own zone.

Handling Special Work

Breakdowns involving work too heavy to be managed by a field gang are handled by two big maintenance shops: A metal shop employing about 200 skilled men, and a machine shop engaging approximately 700 skilled men. In the event of some primary construction job, such as the building of an auxiliary chimney, several field gangs participate. Thus, this system possesses flexibility, since the general foreman in charge of maintenance has the power to call on any and all field gangs when serious trouble or big jobs arise.

Here is an example of how a field gang operates:

An employee from the Emulsion Coating Department reported to his foreman that one of the bearings in his machine had become noisy. The foreman immediately phoned the foreman of Field Gang Three, in whose zone he was, and asked for a couple of men to come over to look at this machine. After inspection, the two mechanics told the foreman that the machine in question had a faulty bearing that would have to be replaced. It was learned that the machine would not be idle until later that night, so it was arranged to have it repaired then. When the maintenance men came that night, they replaced the defective part, and checked the entire machine thoroughly.

This illustrates one of the company's maintenance policies: "If a machine breaks down, repair it, then check it to see that nothing else is wrong." After it has thus been taken care of, it need not be inspected again for three, four, or more months, depending upon the schedule for that particular machine. This plan means that fewer mishaps are likely to occur.

To be prepared for all emergencies, the foreman must know, at all times, exactly where his men are working and how long they expect to be there. This is done simply and easily. When a maintenance man reports anywhere inside or outside his zone, he notifies the foreman in charge where he plans to work and the approximate amount of time he intends to spend there. This foreman, in turn, informs the head maintenance engineer exactly where the employee is. In this way each person is always at the "flinger-tips" of his foreman and the maintenance engineer.

Today it is more important than ever to keep machinery in top shape, since it takes weeks to obtain ma-

terial which is urgently needed. As a result, the company planned a reserve system whereby they asked the engineers from each plant what types of machinery during the past year or two have caused them excessive trouble.

Trouble Survey Helps

At the end of the survey, the foremen, after studying machines in their care, reported that such machines as the punch press, chain-drawn machines, and automatic screw machines were most likely to break down. After the chief engineer received these reports, he ordered as many part replacements as possible for these machines. Now after every part is used, another one is ordered well in advance, so that a stock of at least five of the most vulnerable parts for each machine is kept on hand.

Camera Works, another of Eastman Kodak's plants, has a maintenance system which is under the guidance of one supervisor. Time and experience have taught the maintenance men at Camera Works what machines are likely to break down first. These are checked more frequently, even as often as once a day, to prevent serious trouble. Elevators are serviced on the basis of the amount of use they receive and are thoroughly checked every three months.

The third largest of the company's big plants, Hawk-Eye uses an entirely different system mainly because the plant is not as large as Kodak Park. It consists of five large factory buildings of which one is owned by the Army but operated and maintained by the company. Here Kodak has only one maintenance office, which, like Camera Works, takes care of the entire plant.

To keep all machines in good running order in this plant, a force of 150 men, all specialists in their own field of work, is employed with four shops at its disposal: The electric shop, the sheet metal shop, the machine shop, and the paint shop.

The Sanitary Department, which is generally a separate unit, is a part of the maintenance department at Hawk-Eye. This unit is made up of semi-skilled employees, whose jobs include such functions as replacing cooling systems, or spray heads, and other semi-skilled work, as well as keeping the building free from dirt and dust.

Hawk-Eye shares the need for extreme cleanliness that Kodak Park requires to keep dust off film. In the case of Hawk-Eye, dust must be kept off lenses. Utmost precaution must therefore be taken to keep the plant clean and dust-free. This involves not only the vacuum cleaning of the floors, but also the cleaning of the benches and tables where men work. The cleaning of the elevator shafts every week is also essential. That is why a special sanitary unit is needed to handle this super-cleaning job.

However, preventive maintenance is doubly important at Hawk-Eye, not only to guard against explosions, but also to avoid trouble that would break up a succession of operations in instances where the work on one machine directly affects the output of several others. For example, in the lens-grinding department the polishing machines are dependent upon the work of the light grinders, and they, in turn, rely upon the rough grinders.

The 19-floor Kodak Office Building employs two different maintenance crews: One to service typewriters, dictating machines, and other office apliances; the other to take care of heavier equipment such as elevators, water pumps, water filters, and air-conditioning system.

Elevators, clocks, water pumps and filters are checked regularly by a crew of 21 mechanics. Their policy is "Fix things and fix 'em quick!" They have complete shops, consisting of a metal shop, a crank shop, a telephone room, and other such centers from which they draw materials for repairs. Often situations arise which keep the majority of mechanics working half the night.

The Eastman Kodak Company knows that machines operating from 8 to 24 hours daily must be kept in excellent condition. To accomplish this, the equipment requires proper oiling, accompanied by scheduled checking and immediate attention whenever repair work is needed. Every machine has some weak or defective spot that only men who are thoroughly familiar with that type of equipment can locate. That is the reason such emphasis is placed on the "preventive" maintenance system.

Over all, the rambling and diversified operations of the Eastman Koday Company in its various plants, and the successful workings of its flexible maintenance system provides an overwhelming endorsement of this trouble insurance.

Special Switchboard Aids Chevrolet Maintenance

NEEDLESS TRIPS back and forth from the maintenance shop are eliminated by this 16-line switchboard in the central maintenance shop at the Chevrolet Gear and Axle, serving six central plants. After having completed a job anywhere in the six plants, maintenance men report over this telephone system, and the dispatcher at the switchboard can immediately assign them to another job nearest to the station from which they are reporting. Maintenance foremen handle these calls.

REDEDICATION

An Obligation to Our Fighting Men

DURING the last few weeks we have been forcibly reminded that so long as we still are fighting either of our major foes, first claim upon the productive resources of the United States—its manpower, materials, utilities, and industrial facilities—must be the production and delivery of munitions and war supplies. All other claims are secondary. No responsible citizen would have it otherwise. For in this war even more is at stake than our existence as a Nation. We dare not forget that we are engaged in a struggle that challenges the fundamental values upon which our civilization has been built.

It is not easy to list the values that we are fighting to uphold. They have been clothed in a variety of shapes over the centuries. They will assume new forms in the years ahead. But they have an inner consistency that free men the world over can feel and recognize: the right of the commoner against the noble, the right of the individual against the state, the right of trial by jury, the right to vote, the right to an education, the right to freedom of speech and worship, the right to work in a sphere of one's own choosing, the dignity and the equality of the individual under the law—these are our cultural heritage, painfully won and often precariously held over the ages, always to be rewon, redefined and buttressed by each succeeding generation of men.

The preservation of this vital core of value, and its transmission to our sons and daughters depends upon our victory in this struggle. So those things which are essential to victory must come first. And since the production of war munitions in overwhelming volume and quality can hasten that victory and save countless lives of our fighting men, no effort that will contribute to this end should be regarded by us as a sacrifice.

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The present is no time for self-congratulation upon our achievements either in the theatres of battle or of production. The mounting casualty lists should suffice to curdle the savor of any such indulgence. The most that can be said in reasonable taste and good conscience is that performance in both fields is such as to warrant our firm confidence that we can carry to successful completion the tasks that remain to be done.

Nor is there profit in even observing, much less deploring, that the tasks ahead are more formidable than those which were defined for us a few short months ago. Then, all of us—military leaders, government officials, workers, and business men—were riding a crest of optimism as to an early end of the war in Europe and as to the character and dimension of the war against Japan. Already we had begun to turn anxiously toward the problems of reconversion which then seemed so near at hand. Schedules for war production, based upon the best available estimates of need, called for a 5 billion dollar reduction from 1944 performance, even though we might have to continue a two-theatre war, and for a 40 percent reduction in the event of an early victory in Europe.

Today, those forward estimates have been revised sharply upward. That is true both of the 1945 requirements to meet the needs of a two-theatre war, and of requirements for the Pacific war once the European phase is ended. For this upward revision four chief reasons are responsible:

1. European battle experience has shown markedly greater use of expendable munitions than was provided in the formulae upon which our original production schedules were calculated: the result has been a depletion of inventories on a scale that would become dangerous if allowed to continue.
2. Experience has also demonstrated the need for new types of weapons or increased complements of some existing types to match new enemy equipment or tactics.
3. A less easy optimism as to the early ending of the European war has given rise to a growing disinclination to gamble on the approximate date.
4. An increasing conviction prevails that the war against Japan may require ground-army operations on the Asiatic mainland on a scale greater than originally premised.

But if these changes in the fortunes and outlook of war have raised our estimates of military requirements, may not subsequent favorable changes in the military situation cause them again to be revised downward? It is entirely possible. But our military men have learned that they cannot safely discount what *might desirably happen* as something that *will happen*. Those working on the production front also must learn that lesson. Fortunately, the record shows that we have been able to maintain a war production almost equal to that of the rest of the world combined, even while we produced for civilian use on a scale that has been large even by our

own pre-war standards. So we have ample margin to whip whatever war job may be required of us. As now defined, the task will not be easy. But it *can* and *will* be done.

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What, then, is the production task with which we are charged? Our 1945 production for the two-theatre war now calls for the substantial maintenance of the over-all levels reached in the latter months of 1944. But there is a shift of emphasis. Almost half of the programs for specific equipment items are declining. A few are scheduled to hold level. About 45 percent are scheduled to rise sharply. That means that workers and facilities must be shifted to man the expanding programs. At the same time the armed services are calling for many more men than can be supplied from those who become newly eligible to the 18 year old age group. That means further drafts upon war workers. It means also replacements for them when they are taken from the expanding programs. Finally, events demand that we produce as much as possible of many items during the first half of 1945.

Our task, then, is one of intensified effort for the immediate future, with multiple readjustments at a stage when adjustments are hard to make. Materials for which demand was easing as pipe-lines were being drained in anticipation of falling schedules again are tight as the pipe-lines are being refilled to meet augmented requirements. Men, women, and facilities must be shifted from less essential to more essential tasks. What must be done will be done. But unless there is much voluntary accommodation, it will be necessary for us to suffer a formidable amount of governmental direction which none of us likes, many of us deeply resent, and all of us, when personally affected, volubly protest. The more we police ourselves, the less we shall be policed.

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Even after Germany has been defeated, we shall still face a far from light production requirement to continue the war against Japan. As currently defined this phase might require war expenditures at something like $70 billions a year, an over-all reduction of approximately 20 percent from the $89 billions spent in 1944. Reduction in munitions output would be somewhat greater, probably from 25 percent to 30 percent below 1944 levels. But it is important for us to acknowledge that the reduction is going to be substantially less than the 40 percent previously estimated.

Only a few months ago there were those who questioned sharply the possibility that we might need 60 percent of current munitions output to win the Japanese war. Now the judgment of the military is that 70 percent will be none too high.

Actually the latter level would represent an increase of little more than 50 percent above what now is being produced for the Pacific area. This, certainly, is a modest estimate when we reflect that we shall inevitably more than triple the Army forces assigned to that theatre.

Such a program probably would give us a current munitions supply from three to four times that produced by Japan, but it is believed that we shall need that much to compensate for the advantages derived by Japan from the fact that she will be fighting a defensive war, from the volume of her accumulated stores, from her prepared positions, her shorter lines of supply and transport, and from her large troop reserves, the bulk of which we have yet to meet in battle. Certainly our present 3 to 1 production edge over Germany does not appear to be excessive.

The more modest V-E Day cuts contemplated by the present plan will mean a less acute reconversion problem when they are made, but will leave a greater one to be met at the end of the war. They will mean probably a net increase of not more than 4 million workers available for civilian work during the transition period. Their orderly absorption should present no embarrassing problem. Indeed, we now are warned by Washington that war production following V-E Day may require the protection of considerably closer control than was contemplated under the 40 percent cuts previously expected.

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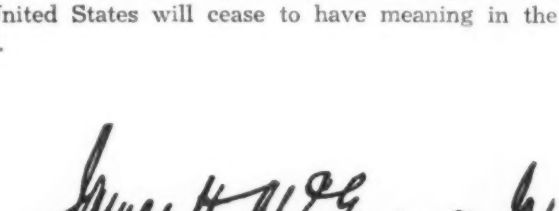
In short, we face for the immediate future a more difficult production job. It is made the more formidable by the fact that we had dulled the keen edge of our will to produce by our premature expectation of a reduction in requirements. Now we are told that the trend of war production for the immediate future is up, that it is unsafe to discount the date of victory in Europe, and that the amount of leeway for reconversion after the defeat of Germany is less than had been anticipated.

Accordingly, we must rededicate ourselves to the task of driving war production up. We must do without some of the things that we have enjoyed on the civilian front rather than demand more of those things; we have still to devote our abilities and energies first and foremost to the demands of war.

Whatever will assure and hasten victory must have first place in any statement of American policy.

Without victory, our aims, and the underlying values upon which they are based, will be extinguished, blotted out by the opposing aims and values proclaimed by our enemies.

The needs of our fighting men must be put first. For, unless we win the war, the National aims and policies of the United States will cease to have meaning in the world.



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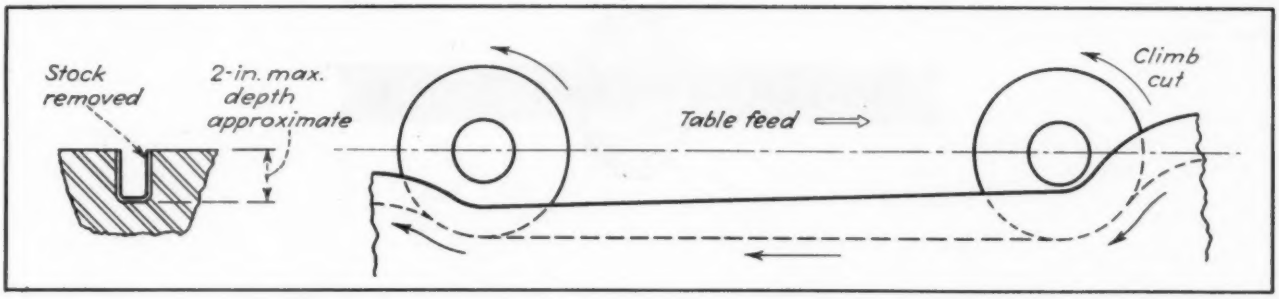


Cross-section of a channel milled on master rods is at left. The milling fixture sketched accommodates two rods in the horizontal position. One rod is shown with the cutter positioned near the start and finish of the cut

New Cutter Doubles Production

BY W. BADER, FIELD ENGINEER, TUNGSTEN CARBIDE TOOL COMPANY

Polishing time on the master rods was reduced so much that special grinding was avoided

PROPERLY DESIGNED carbide-tipped cutters used in the finish milling operation on the channel of radial engine master rods have doubled production on the operation in at least one engine plant and drastically reduced the time required for final polishing of the channel.

The operation consists of profile milling the channels in the master connecting rod to remove from 0.020 to 0.025 in. of stock. A surface entirely free from burns and with a minimum amount of tool marks is required.

The milling operation is currently performed on new Cincinnati tracer-controlled Hydromatic milling machines with a 15-hp. motor. Accurate duplication of a master profile templet is obtained automatically through the hydraulic tracer mechanism.

The two high-speed steel cutters originally used had 20 teeth and were 6 31/32 in. in diameter, 1.355 in. wide, and had 0.180 in. radii on both sides to conform with the cross-section of the master-rod channel. Cutter speed averaged 90 surface ft. per min. Production ran about 100 pieces per machine per 8-hour shift with a total of 65 pieces per cutter grind. With these cutters the finish on the channels was such that as high as 0.010 to 0.012 in. of stock had to be polished out of the channel to remove all traces of tool marks. Time required for polishing was approximately 2 hours per rod, which bottlenecked the entire master-rod operation.

A costly additional grinding operation was being considered and a special grinder actually was being designed for this purpose. However, before the design was completed, a side milling cutter tipped with tungsten-tantalum-titanium carbide was developed for this application at Tungsten Carbide Tool Company. Performance obtained with this cutter made grinding unnecessary. The cutter was of the inserted-blade type with staggered teeth to allow for adjustment of diameter and width. Cutter specifications are:

Number of blades	16
Axial rake	—5 deg.
Radial rake	—5 deg.

There is an additional 7 deg. negative land across the nose radius on a 45 deg. angle. Serrations were eliminated with a locking device consisting of a screw and wedge with a locking taper. This arrangement helped assure maximum tool life.

Chip breakers 1/16 in. wide and 1/32 in. deep are alternately spaced two in one blade and one in the following blade on each side of the cutters. It has been found that these chip breakers split up the chips at the bottom of the channel, reducing the friction considerably, lessening the vibration, and increasing tool life.

Inserted-blade cutter with staggered teeth allows adjustment for diameter and width

With this type of cutter, using climb milling, optimum performance is obtained by using a cutter speed of 455 surface ft. per min. with a feed of 5½ in. on a straight line and 2 in. per min. on generated radii. Production has been increased to 205 pieces per machine per 8-hour shift (more than 100 percent increase) with a total of 110 pieces per grind, double the former amount, despite the fact that cutters are not permitted to become as dull as formerly before grinding.

Because of the excellent finish in the channels, only 0.0025 in. of stock has to be removed in polishing. Thus the bottleneck which existed in the polishing department has been eliminated, making it unnecessary to acquire any additional equipment, such as special grinders, to solve the polishing time problem.

Milling Cutters and How to Use Them

Special Rake Angles Used For Sintered Carbide Tools

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI, MILLING MACHINE COMPANY

When choosing rake angles for milling cutters the effective rake should be kept in mind. The author tells how to compute it in the seventh part of a series

ZERO AND NEGATIVE rake angles are frequently employed in sintered carbide-tipped cutters to increase the tooth angle and thus provide more material back of the tooth face. In this way, the tooth is given greater strength to resist shock loads. Such cutters are operated at speeds five to ten times those normally considered satisfactory for high-speed steel milling cutters. Under these conditions, an excellent finish will be produced on the milled surface, and the power required to form a chip under given conditions will be about the same as with high-speed steel cutters.

Selection of Rake Angles

High-Speed Steel—Standard plain milling cutters of high-speed steel are made with a positive rake angle of 10 to 15 deg. in order to obtain the best compromise between cutting efficiency and tool strength for all-around use. These values prove satisfactory for milling steels of various compositions. When milling softer materials such as magnesium and aluminum alloys, however, the rake angle may be increased to 25 deg. or more.

In special milling cutters, the rake angle is made to suit the particular operation.

Rake angles of high-speed steel metal-slitting saws operating on alloy steel are positive, and vary between 5 and 10 deg. A zero and sometimes a slightly negative rake angle is used in saws operating on copper and soft non-ferrous metals in order to prevent the tendency to "hog-in."

Standard form relieved cutters may have a rake angle of 10 deg., 5 deg., or zero. Since the rake angle cannot be changed without distorting the contour of the cutter, it is necessary to maintain the rake angle accurately at the original value when resharpening the cutter.

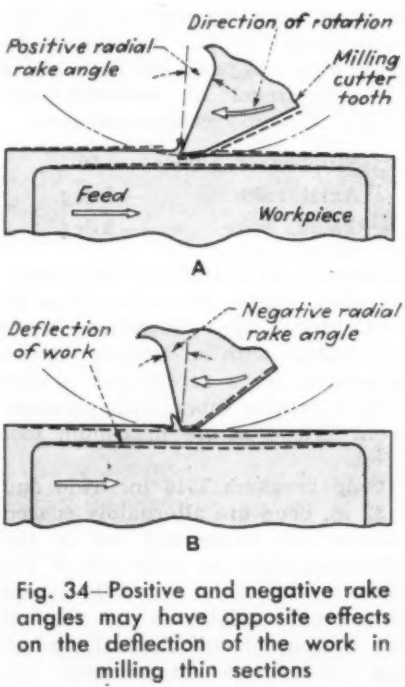


Fig. 34—Positive and negative rake angles may have opposite effects on the deflection of the work in milling thin sections

Commercial face milling cutters of high-speed steel usually have 10-deg. positive radial rake and axial rake angles. These angles are found satisfactory for general use in milling cast iron, forged steel and alloy steel, and non-ferrous metals such as brass and bronze.

When milling castings and forgings of magnesium and of free cutting aluminum and their alloys, with high-speed steel cutters, both the radial and axial rake angles may be increased up to 25 deg. positive or more, depending upon operating conditions. In the case of abrasive or difficult to machine aluminum alloys, a smaller rake angle is used.

Cast Non-Ferrous Tool Materials—In cutters of cast tool material, positive rake angles are generally provided, although negative angles may be employed advantageously in operations where shock loads are encountered, or where it is necessary to eliminate the vibration when milling thin sections.

Sintered Carbide—Peripheral milling cutters, such as slotting cutters, saws, etc., tipped with sintered carbide, generally have negative rake angles ranging from about 5 deg. for soft low carbon steel to 10 deg. or more for alloy steel, and positive rake angles of 10 deg. to 20 deg. when operating on soft non-ferrous materials such as free cutting aluminum alloys. When milling abrasive or difficult to machine alumi-

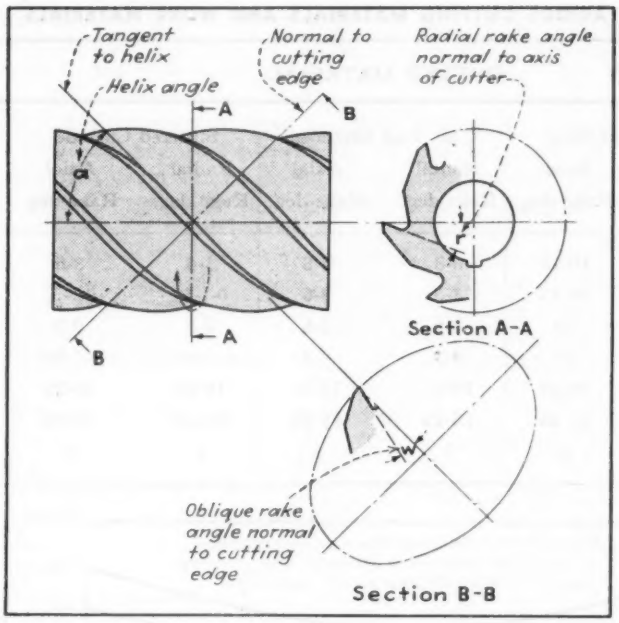
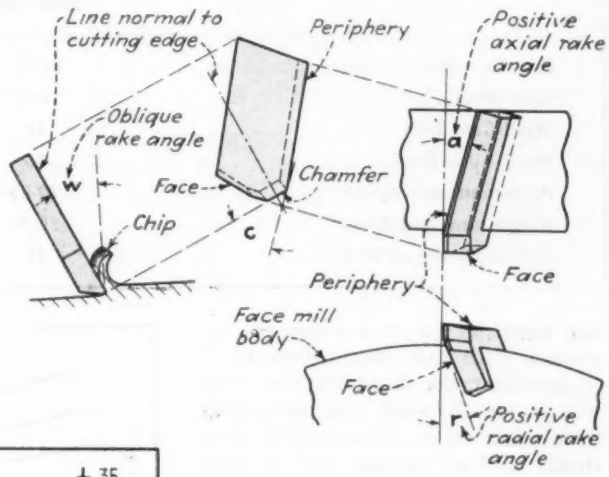


Fig. 35—The oblique rake angle is in the plane normal to the cutter edge and not to the axis of a helical cutter

Fig. 37—The oblique rake angle in a face mill is shown projected to its cutting position



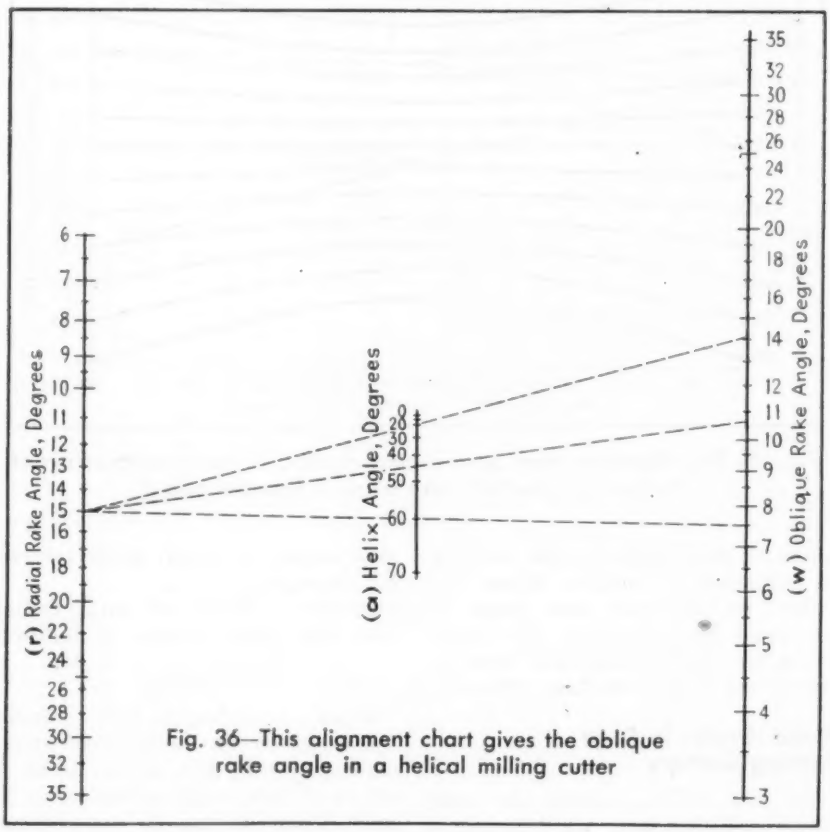


Fig. 36—This alignment chart gives the oblique rake angle in a helical milling cutter

num alloys, small positive or even negative rake angles are used.

In face milling cutters tipped with sintered carbide, a great variation is found in the value of radial and axial rake angles, both in relation to the grade of sintered carbide material used, the material being cut, and the cutting conditions. In general, the radial and axial rake angles may either be both positive, both negative, or one positive and one negative. See Table III.

Positive radial and axial rake angles of 3 to 7 deg. are commonly used for milling cast iron. When face milling steel, however, and particularly the hard alloy type, cutters having negative radial and axial rake angles are found to provide increased production and more economical cutter life. These negative rake angles may range from 5 deg. for soft low carbon steel to 10 deg. or more for alloy steel. Negative rake angles are sometimes used in applications where it is necessary to mill thin sections such as the cover plate shown in Fig. 34. Using a plain milling cutter with a large positive radial rake angle, the cutting force will deflect the section upward, while the cutter is deflected downward and a momentary increase in the depth of cut and the thickness of the chip will result.

The exaggerated deflection resulting from the use of a large positive rake angle is indicated by the broken lines in Fig. 34*A*.

The amount of deflection will depend on the force required to form the chip, the rigidity of the part being milled and the type of cutter.

As the material of the chip yields and is separated from the workpiece, the work and cutter tend to release each other. When this occurs, they move back in opposite directions to resume the relative "no load" position, the cutter moving up and the work down. Because of the intermittent engagement of the cutter teeth, there is a periodic repetition of this action, and the milled surface will show a series of fine grooves or lines which are known as "chatter marks."

If the rake angle is small, the resultant force between the tooth and the chip is approximately parallel to the surface being milled, and no appreciable deflection of the work will result.

If the rake angle is negative, as shown in Fig. 34*B*, the resultant force between the tooth and the work will be downward, tending to separate the tooth and work. When

TABLE III—FACE MILLING CUTTER RAKE ANGLES FOR VARIOUS CUTTING MATERIALS AND WORK MATERIALS

MATERIAL CUT	CUTTER MATERIAL					
	High-Speed Steel		Cast Tool Material		Sintered Carbide	
	Radial Rake-deg.	Axial Rake-deg.	Radial Rake-deg.	Axial Rake-deg.	Radial Rake-deg.	Axial Rake-deg.
Soft Cast Iron	10-15	10-15	6-8	6-8	3-6	3-6
Mild Steel	10-15	10-15	3-6	3-6	0-(-5)	0-(-5)
Hard Cast Iron	10	10	3-6	3-6	0-3	0-3
Hard Alloy Steel	10	10	0-3	0-3	0-(-10)	0-(-10)
Aluminum and Alloys	20-35	20-35	10-15	10-15	10-20	10-20
Magnesium and Alloys	20-35	20-35	15-25	15-25	15-25	15-25
Yellow Brass and Bronze	10	10	5	5	3	3

the intensity of this pressure decreases with the intermittent tooth engagement, the work and the tooth will move forward and not away from each other. This results in a steady cutting action and a good finish.

Rake Angle in Plain Milling Cutters

In a plain milling cutter having helical teeth, the rake angle, measured in the cross section of the cutter normal to the axis is not the same as the rake angle measured in the cross section of the cutter normal to the cutting edge.

This is illustrated in Fig. 35. It will be seen that the radial rake angle in the section normal to the axis of the cutter, projected at the upper right, is greater than the rake angle in the section normal to the cutting edge, projected below.

In such cutters, for a known helix angle, the value of the rake angle normal to the cutting edge (oblique rake) can be obtained from the radial rake angle by means of the following formula:

$$\tan w = \tan r \cos a \qquad (4)$$

where

w = oblique rake angle, degrees,
r = radial rake angle, degrees,
a = helix angle, degrees.

The chart in Fig. 36 shows the value of the oblique rake angle w for various assumed values of the angle a and of the radial rake angle r. Thus it can be seen that if the radial rake angle r is 15 deg., the oblique rake angle corresponding to values of the helix angle a of 20, 45 and 60 deg. will be approximately 14 deg., 10¾ deg., and 7½ deg., respectively.

It is therefore evident that in order to obtain the proper value of the oblique rake angle, it is necessary to consider the change produced in the value of this angle by the angle a as indicated in Formula 4, and the values of the radial rake angle in its usual interpretation, the latter being the angle commonly used in describing helical milling cutters.

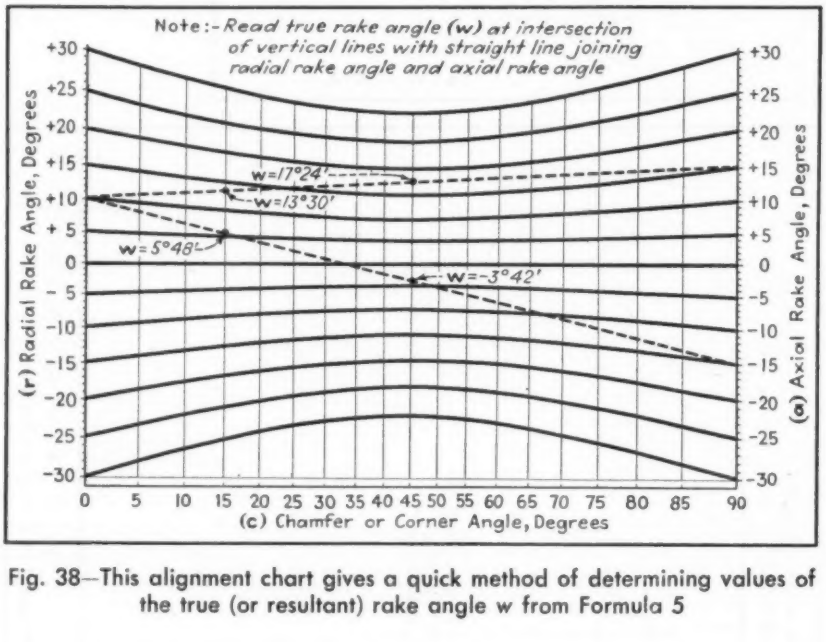


Fig. 38—This alignment chart gives a quick method of determining values of the true (or resultant) rake angle w from Formula 5

Rake Angles in Face Milling Cutters

In face milling cutters the rake angle resulting from a given combination of radial and axial rake angles used in practice, can be calculated by means of the following formula:

$$\tan w = \tan r \cos c + \tan a \sin c \qquad (5)$$

The resultant angle w is known as the true rake angle.

The value of w can be obtained also from the alignment chart shown in Fig. 38 at the point of intersection on the vertical line corresponding to the corner angle c with a straight line drawn between the selected values of the radial and axial rake angles, as shown in the following examples:

Example 1. Values of axial, radial rake and corner angles, as follows: $r = +10$ deg. $a = +15$ deg. $c = 45$ deg.

Draw a straight line joining +10 deg. on the radial rake angle scale and +15 deg. on the scale of the axial rake angle at the point of intersection on the 45 deg. corner angle read true positive rake angle $w = 17\frac{1}{2}$ deg. In this case the true rake angle is positive and greater than either of the axial or radial rake angles.

Example 2. Values of axial, radial rake and corner angles, as follows: $r = +10$ deg. $a = -15$ deg. $c = 45$ deg.

Draw a straight line between the point +10 deg. on the radial rake scale and —15 deg. on the axial rake angle scale. The true rake angle w on the 45 deg. corner is minus 3¾

deg. Thus in this case, the negative rake angle produces a negative value of the true rake angle w. By assuming different values for a, r and c, the corresponding values of w can be obtained either by means of alignment chart shown in Fig. 38 or by direct calculation by means of Formula 5.

When the values of the radial and axial rake angles are large, the resultant angle (oblique rake) will be more correctly determined by means of the following formula (see Fig. 37):

$$\tan w = \tan r \cos a \cos c + \tan a \cos r \sin c \qquad (6)$$

where

w = oblique rake angle, degrees,
r = radial rake angle, degrees,
a = axial rake angle, degrees
c = corner angle, degrees.

This is a general formula because it can be used to compute the oblique rake angle in face mills having a large chamfer or bevel, or a sharp corner and also in helical mills. In the last two cases the corner angle is zero and Formula 6, after making the necessary simplifications will be reduced to the form of Formula 4.

In face milling cutters having a "sharp corner," the oblique rake angle is measured in a plane perpendicular to the cutting edge on the periphery, as in the case of helical mills.

In cutters having a large chamfer or bevel, the oblique rake angle obtains in the plane normal or perpendicular to the chamfer, since this is approximately the direction of chip flow (see Fig. 37).

In cutters having rounded corners, the oblique as well as the true rake angles vary uniformly throughout that portion of the cutting edge actually engaged in the cut.

Examples showing the application of Formula 6:

Example 1. Calculate the oblique rake angle w in a face milling cutter having the following values of radial, axial and corner angles:

$r = +10$ deg. $a = +15$ deg. $c = 45$ deg.

Substituting these values in Formula 5:

$$\tan w = \tan 10 \cos 15 \cos 45 + \tan 15 \cos 10 \sin 45$$

And replacing with the corresponding values of the trigonometric functions:

$$\tan w = 0.176 \ 0.966 \ 0.707 + 0.268 \ 0.985 \ 0.707$$

After performing the multiplications indicated, the following result is obtained:

$$\tan w = 0.120 + 0.187 = 0.307$$

therefore

$$w = +17 \text{ deg. } 4 \text{ min.}$$

Thus in this case the oblique rake angle is positive and greater than either of the axial or radial rake angles.

Example 2. Calculate the oblique rake angle w in a face milling cutter having the following values of radial, axial and corner angles:

$r = +10$ deg. $a = -15$ deg. $c = 45$ deg.

Substituting these values in Formula 6:

$$\tan w = \tan 10 \cos (-15) \cos 45 + \tan (-15) \cos 10 \sin 45$$

But in general, $\cos(-a) = \cos a$ and $\tan(-a) = -\tan a$, therefore:

$$\tan w = \tan 10 \cos 15 \cos 45 - \tan 15 \cos 10 \sin 45$$

Replacing the corresponding values of the trigonometric functions:

$$\tan w = 0.176 \ 0.966 \ 0.707 - 0.268 \ 0.985 \ 0.707$$

After performing the multiplications indicated, the following result is obtained:

$$\tan w = 0.120 - 0.186 = -(0.186 - 0.120) = -0.066$$

therefore

$$w = -3 \text{ deg. } 47 \text{ min.}$$

Thus in this case the negative axial rake angle produces a negative value of the oblique rake angle w.

By assuming different values for a, r and c, the corresponding values of w can be obtained. Table IV gives values for cases in which c is 45 deg.

It can be seen readily that the oblique rake angle is larger than either the radial or axial rake angles for equal positive or negative values of this angle, and that by combining different positive and negative values of either radial or axial rake angles, it is possible to obtain a positive oblique rake angle even though one of the other angles may be negative.

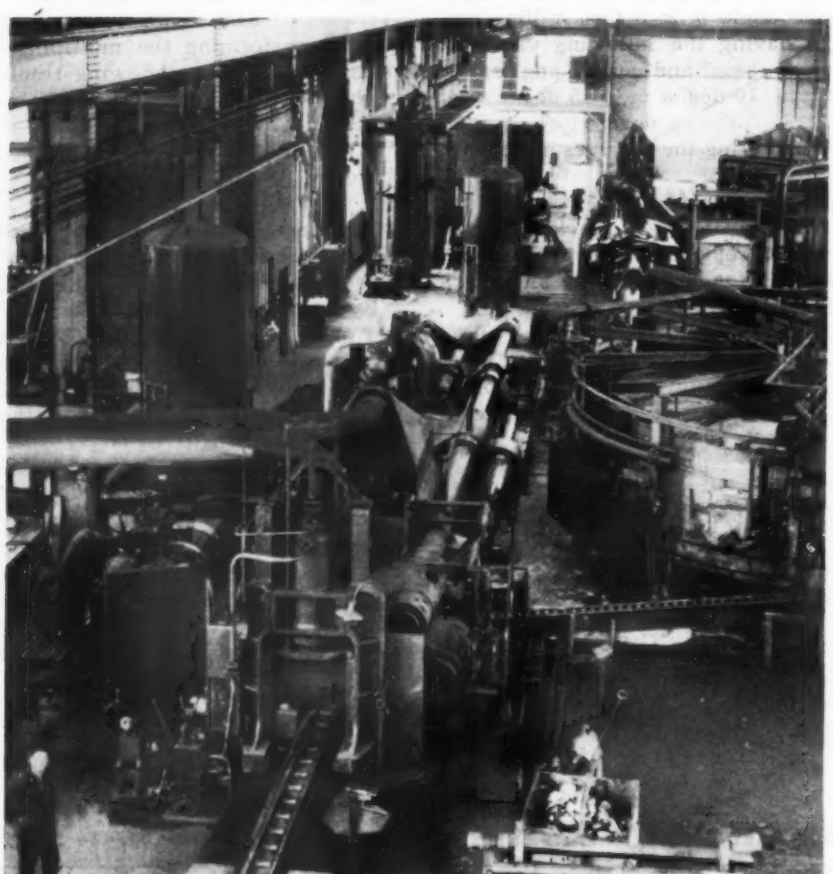
The eighth installment of Mr. Martellotti's series, describing correct clearance and relief angles, will apear in an early number

TABLE IV—VALUES OF OBLIQUE RAKE ANGLE IN FACE MILLS WHEN CHAMFER ANGLE C=45°

	Axial Rake Angle a												
	−30°	−25°	−20°	−15°	−10°	−5°	0°	5°	10°	15°	20°	25°	30°
Radial Rake Angle	Effective Rake Angle w												
−30	−35°16′	−33°15′	−31°14′	−29°11′	−27°1′	−24°43′	−22°12′	−19°27′	−16°23′	−12°58′	−9°8′	−4°50′	0
−25	−33°15′	−30°52′	−28°43′	−26°13′	−23°46′	−21°2′	−18°15′	−15°14′	−12°6′	−8°14′	−4°23′	0	4°50′
−20	−31°14′	−28°43′	−25°49′	−23°6′	−20°20′	−17°28′	−14°26′	−11°13′	−7°46′	−4°2′	0	4°23′	9°8′
−15	−29°11′	−26°13′	−23°6′	−20°6′	−17°4′	−13°57′	−10°44′	−7°21′	−3°47′	0	4°2′	8°14′	12°58′
−10	−27°1′	−23°46′	−20°20′	−17°4′	−13°48′	−10°29′	−7°6′	−3°37′	0	3°47′	7°46′	12°6′	16°23′
−5	−24°43′	−21°2′	−17°28′	−13°57′	−10°29′	−7°2′	−3°32′	0	3°37′	7°21′	11°13′	15°14′	19°27′
0	−22°12′	−18°15′	−14°26′	−10°44′	−7°6′	−3°32′	0	3°32′	7°6′	10°44′	14°26′	18°15′	22°12′
5	−19°27′	−15°14′	−11°13′	−7°21′	−3°37′	0	3°32′	7°2′	10°29′	13°57′	17°28′	21°2′	24°43′
10	−16°23′	−12°6′	−7°46′	−3°47′	0	3°37′	7°6′	10°28′	13°48′	17°4′	20°20′	23°46′	21°1′
15	−12°58′	−8°14′	−4°2′	0	3°47′	7°21′	10°44′	13°57′	17°4′	20°6′	23°6′	26°13′	29°11′
20	−9°8′	−4°23′	0	4°2′	7°46′	11°13′	14°26′	17°28′	20°20′	23°6′	25°49′	28°43′	31°14′
25	−4°50′	0	4°23′	8°14′	12°6′	15°14′	18°15′	21°2′	23°46′	26°13′	28°43′	30°52′	33°15′
30	0	4°50′	9°8′	12°58′	16°23′	19°27′	22°12′	24°43′	27°1′	29°11′	31°14′	33°15′	35°16′

Huge Press Extrudes Nickel-

Various nickel alloys will be extruded in larger tubes (Monel to 7¼ in.), opening new fields to designers needing corrosion-resistant and strong cylinders



Representing a considerable but profitable investment, the 4000-ton Hydropress is seen from the discharge end, while the billet heating furnace is at the right

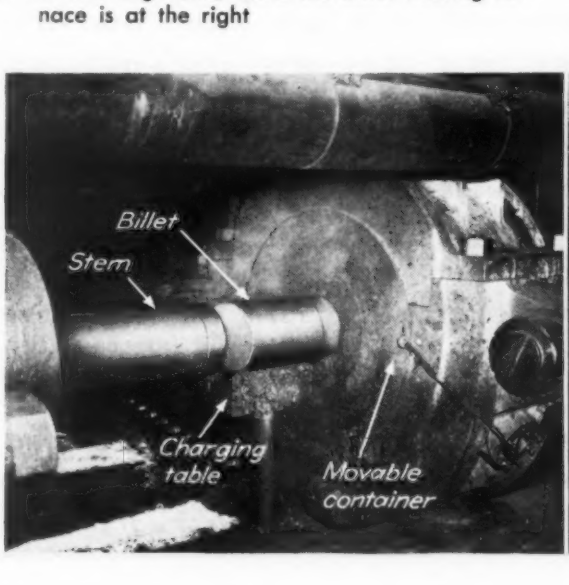
IN ANTICIPATION of increasing demand for tubular products made of high-nickel alloys, and especially in sizes larger than formerly available, the International Nickel Company, Inc., has installed a 4000-ton extrusion press at its Huntington, West Va., works. This machine extrudes Monel tubes to 7¼ in. O.D. to standard commercial tolerances for size, concentricity and finish. It will also serve this company as a more economical source of half-finished material for subsequent cold drawing to smaller sizes. Internal surface of the extruded tubes is of high quality.

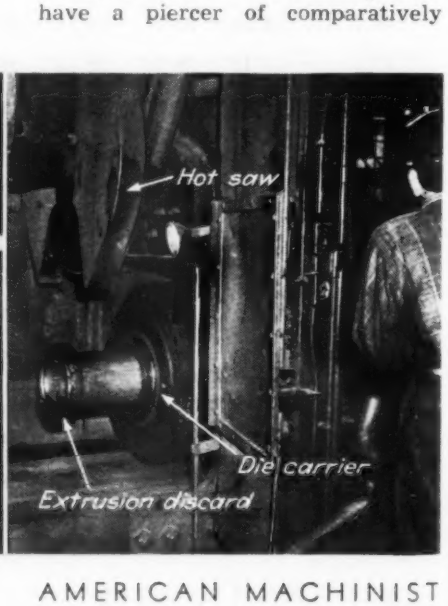
Metals handled to date on the press include: Monel, K-Monel, pure nickel, Z-nickel, Inconel, gilding metal and SAE 52100 (for bearing-race stock). Although the machine has a maximum capacity of 11 in. O.D. tubes by ½ in. wall, the size of tubing produced in any metal depends upon the resistance to hot working and the economical length of piece that can be obtained from the original billet. Based on the experience of a Scottish affiliate company, there is also the possibility that the press may be used for making solid extrusions in various cross-sections.

Built for Nickel Alloys

Extrusion presses of large capacity are fairly common here and abroad, but the Inco machine is specially designed for making large size tubes from high-temperature metals and alloys. The press was built by Hydropress, Inc., New York.

Whereas other extrusion presses have a piercer of comparatively





Left—After the charging table elevates the heated billet to the correct height, the stem pushes the piece into the movable container for the piercing operation. Right—to remove the extrusion discard from the extruded tube, the die carrier is moved to the right under the hot saw

Alloy Tubing

small capacity, this machine with a main ram capacity of 2500 tons works together with a piercer of 1500 tons capacity, resulting during the extrusion stroke in a total capacity of 4000 tons. The main ram actuates a hollow stem which is used for extrusion, and the piercing ram powers a piercing mandrel that moves within the hollow stem. Furthermore, this press is designed for fast operation, so consuming large volumes of pressure water in extremely short time intervals. Fast operation of the press is important because the high-nickel alloys are preferably worked rapidly in a range, which lies between 2000 and 2360 F.

In order to achieve economy in the amount of pressure water per cycle, a low-pressure prefilling system eliminates the consumption of high pressure water during the idle movements of the large rams.

The pressure water is supplied by two horizontal triplex pumps, each driven by a 330-hp. motor, and the water is pumped into an air-loaded accumulator, the latter being connected to the operating valves of the press.

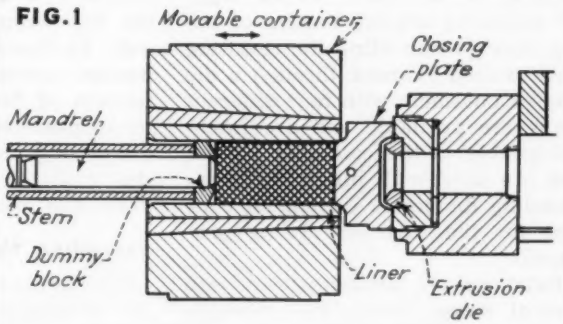
Gilding-Metal Tubing

One of the current uses of the 4000-ton press is the production of a gilding-metal tubing of 8.900 in. O.D., 7.945 in. I.D. to be cut into 2 in. lengths for driving bands for 8 in. artillery shells. The tubing is produced in 10 ft. lengths, starting with an 11⅞ x 18-in. billet, at an average rate of 100 pieces per shift, or 160,000 lb. in 24 hr. Concentricity of the finished shell band is such that it can be applied to the projectile without machining the I.D. and the cost is appreciably less than for bands made by other methods.

The billets are heated to 1670 F. in a Surface Combustion rotary-hearth furnace, using a reducing atmosphere to avoid oxide and blisters on the metal. A heated billet is picked off the hearth hydraulically and progresses down a gravity roller conveyor to the charging station in the press. Here the billet is picked up by a table, turned 90 deg. and lifted to the level of the horizontal container bore.

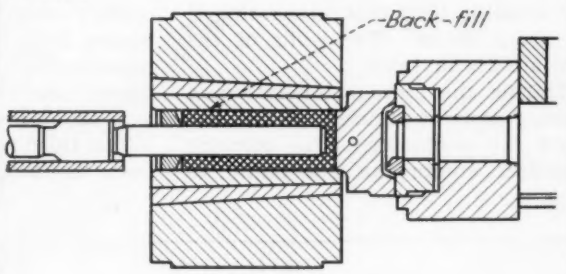
The container is inclosed in a split casting, and the whole assembly is hydraulically moved to either of two positions: to the left for piercing or

FIG. 1



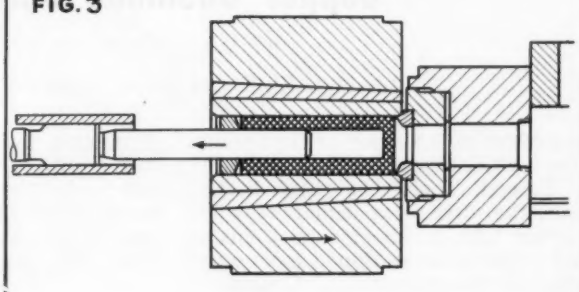
Heated billet placed in the container bore, and die opening closed by means of die closing plate

FIG. 2



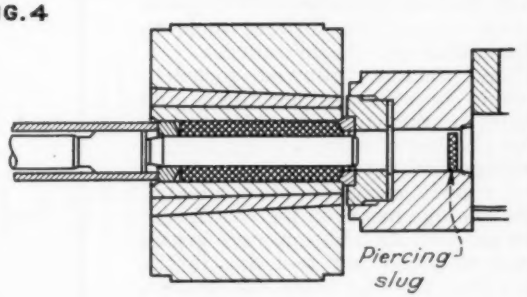
Piercing mandrel advances and hollow stem moves backward for piercing the billet, the elongated billet backfilling the container

FIG. 3



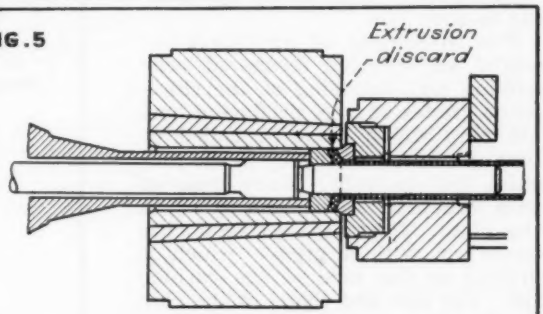
The die closing plate has been lifted and the movable container has contacted the die

FIG. 4



The advancing mandrel has pushed out the bottom of the hollow billet, and starts to advance through the die opening, with the hollow stem moving at the same speed

FIG. 5



The extrusion strotke is finished with the tube protruding through the die arrangement, leaving a short piece of unextruded metal betweeen the die and the dummy block

cupping of the billet; to the right for punching out the bottom of the cup prior to extruding the resulting thick-walled cylinder through a die ring. Containers with four different bores are available and are interchangeable in the container holder, and are used with billets of corresponding diameters and metal content for the tube size being produced.

Extrusion is broken down into several steps. First, the movable container is moved to the left position. With a billet in the container the piercing mandrel moves forward for cupping the billet, elongating it to about 29 in. The walls of the cup are 2⅛ in. thick.

During the piercing operation, a closing plate is securely locked behind the container. The piercing mandrel enters the hot metal to within 1 to 2 in. of the bottom of the cup without fear of pushing it out. Furthermore, the "plug" at the bottom represents a waste of only 5 percent of billet weight, compared to aprpoximately 40 percent if no die closing plate were used, as it is the case on all other extrusion presses in operation.

Extruding the Tube

The second step is to push out the plug to leave a cylindrical shell for extrusion. The die closing plate is lifted, and the movable container is traversed to the right until in contact with the die, which is supported in a carrier. The mandrel punches the bottom of the cup, then moves into the die opening to act as a sizing mandrel for the tube.

The third operation is to advance both the mandrel and the hollow stem at the same speed (using pressure water) so pushing the cylindrical forging through the die ring, leaving only a short piece of unextruded metal in the container.

In the fourth operation, the die carrier is unlocked and the whole die arrangement with the extruded tube in the die is moved hydraulically outside of the press. Then a hot saw is used to cut off the unextruded part of the billet from the tube.

Fifth operation: The die carrier, with the tube still sticking in the die, is moved toward the press for ejecting the tube, so that it can be taken away by the moving part of the run-out table.

The total discard, including trimming the two ends of the tube and the plug pierced out of the bottom of the pierced cup, amounts to only 16 percent of the billet weight.

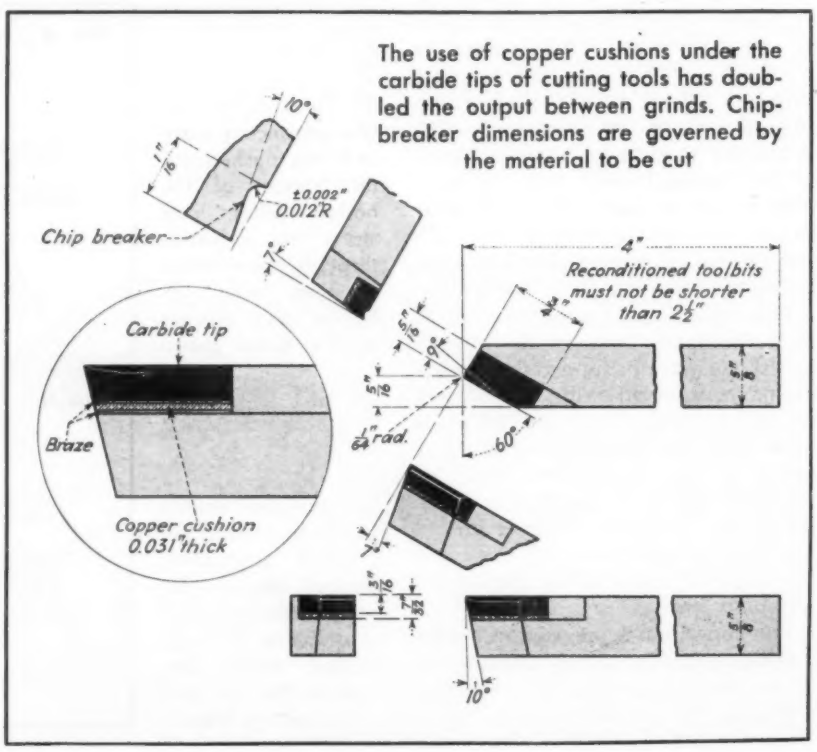
Copper Cushions Benefit Carbide-Tipped Tools

BY WILLIAM A. M. WELLES, CHIEF TOOL DESIGNER,
SMALL ARMS DIVISION, AMERICAN TYPE FOUNDERS, INC., FITCHBURG

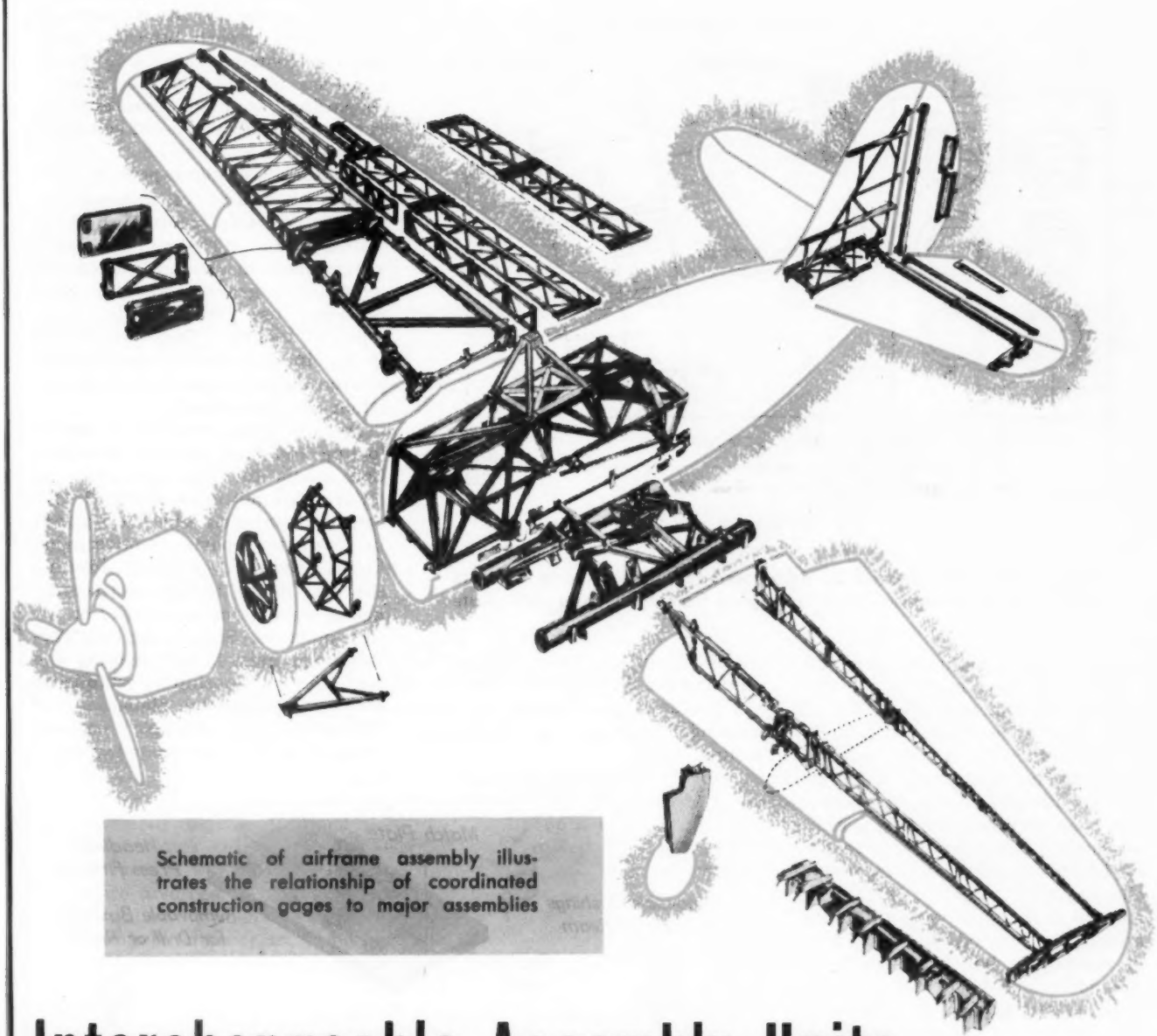
FOLLOWING PUBLICATION of the article "Use of 'Cushions' Adds to the Life of Tipped Tools" by Leo J. St. Clair, the writer experimented with brazing 1/32-in. sheet-copper cushions under carbide-tipped tools with rather surprising results. Considerable difficulty had been experienced in machining Browning rifle barrels from forgings because of hard spots, which caused the turning tools to break, chip or become dulled.

The practice followed formerly was to braze a carbide tip to the shank in the conventional manner. The number of barrels rough turned averaged 50 between grinds. Since the copper cushions were adopted this average has been increased over 100 percent. In addition more grinds were obtained per tool due to the fact that the tips were not broken, but only chipped slightly, making them easier to regrind thereby adding to their life.

The machining of any steel requires an effective means of controlling and disposing of the chips. Some grades of steel produce a long hot chip which must be coiled or broken to prevent injury to the machine tool operator. Many types of chip breakers have been tried in this plant. The most satisfactory has been one with a groove which is ground in the face of the carbide tip. The size and shape of the chip breaker is governed by the material being cut, also the speed, feed and depth of cut. A sufficient quantity of cutting fluid is directed on the tool point, to quench the hot chips and make them brittle and easily breakable. The most satisfactory type of tool is shown in the illustration. The steel being machined is WD4150. Its heat-treatment is as follows: Normalize at 1700 F.; air cool; heat to 1600 F.; hold for one hour, air cool to 1000 F. Pull at 250 F. Draw at 1200 to 1230 F. for three hours.



The use of copper cushions under the carbide tips of cutting tools has doubled the output between grinds. Chip-breaker dimensions are governed by the material to be cut



Schematic of airframe assembly illustrates the relationship of coordinated construction gages to major assemblies

Interchangeable Assembly Units Coordinated by Master Tooling

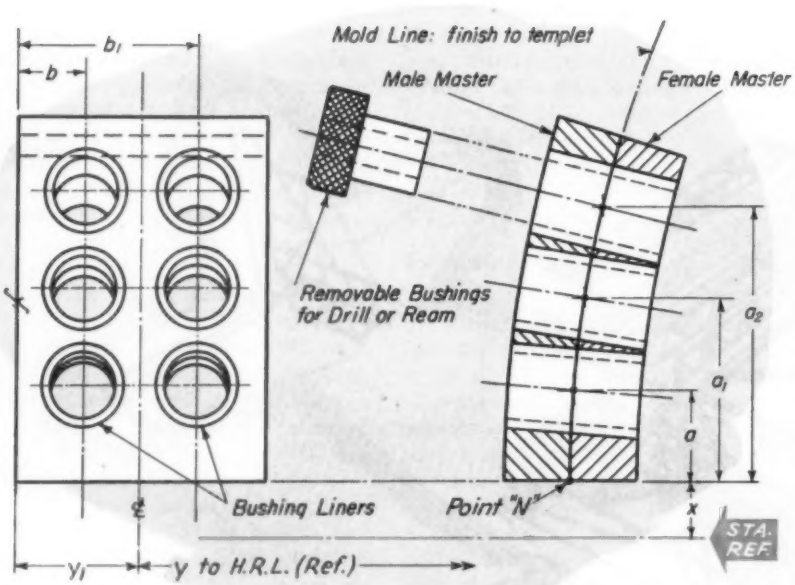
BY STANLEY E. VICKERS, PRODUCTION TOOL ENGINEER
COLUMBUS, OHIO, PLANT, CURTISS-WRIGHT CORPORATION

Application of the three basic elements — match plates, drill plates and construction gages — is shown for master tooling

IT IS generally recognized that most efficient production of units assembled of many components is difficult to attain unless provision is made for interchangeability.

Small units wholly composed of completely machined components are relatively simple to maintain. The interchangeability limits usually may be established in machine tolerances, and the least efficient condition under the circumstances may be a selective fit of a few parts.

In the case of large units, wherein the assembly is broken down to several subassemblies, the maintenance of interchangeability limits becomes a difficult problem. The exceptionally close tolerances required for interchangeability are not compatible with the



Master drill plates are set up and bored together, insuring absolute mating of all production drill jigs bored from the master drill plate

practical manufacturing procedure.

There are two methods of overcoming this difficulty when working with large assemblies.

One method is to finish-machine those fittings controlling the interchangeability after the subassembly has been completed. This permits all cumulative assembly tolerances to be disregarded and the interchangeability tolerance to be restricted to the final machining tolerance. This method requires the use of machinery built specifically for the operations performed. Exceptionally long production runs, without engineering changes, are necessary to justify the expense involved.

Another method of insuring interchangeability, without using special machinery, requires coordinated master tooling to control the location of assembly fastenings.

Three Basic Elements

There are three basic functional elements in master tooling; match plates, master drill plates and construction gages.

Match plates establish and control the relationship of a small pattern of holes to each other. They are used to control coordination of individual part tooling where tooling duplication is not excessive. The hole diameters in the match plate bushings are equivalent to the full size hole specified for the finished part.

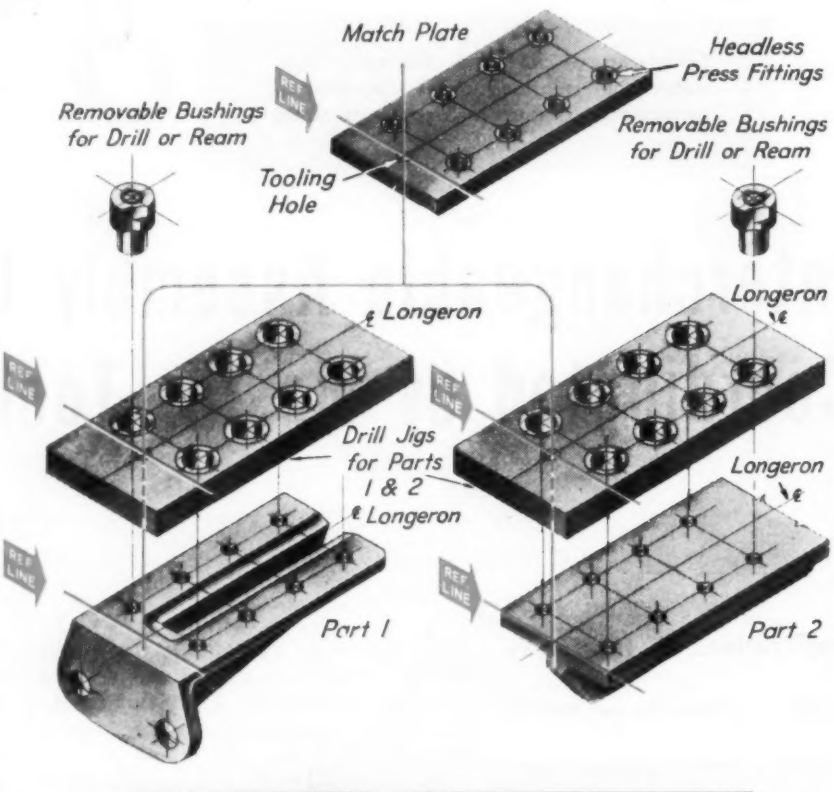
Master drill plates are used for reproducing the same hole pattern accurately in a number of tools, by allowing the direct transfer of oversize holes to accommodate the drill bushings required in production tooling.

Construction gages establish several hole patterns or fitting surfaces in relation to each other or to a definite tooling location. These gages are, in most instances, a master part and are used almost entirely to control the set-up of assembly tooling.

A physical reference point for dimensional control of a group of holes or surfaces is established by tooling holes. Tooling holes for match plates, master drill plates and construction gages follow the conventional use employed in other types of tooling. They are placed at the intersections of engineering reference lines to permit easy calculation for dimensioning.

Tooling holes, provided in master tooling and used only as coordination media for the fabrication of fixtures, are not to be confused with construction holes, which are placed in production parts. Construction holes provide a means of locating the part in the tooling and coordinating various hole patterns or fitting surfaces. Since these construction holes exist in both tooling and part, the relationship is established by means of a match plate.

Reproduction of hole patterns from a match plate may involve a



Bored from match plate hole locations, production drill jigs will produce matched hole patterns. The use of match plates is not desirable in instances of multi-plane contact or contoured partings

complete hole pattern or a portion of it. In all instances, locations must be taken from the tooling hole to insure the correct relationship.

When a single hole pattern, or portion, must be reproduced in production tooling an excessive number of times, the use of a master drill plate is indicated. This permits drilling and reaming direct to the size required for insertion of the bushings in the production drill jig.

Coordination of Hole Patterns

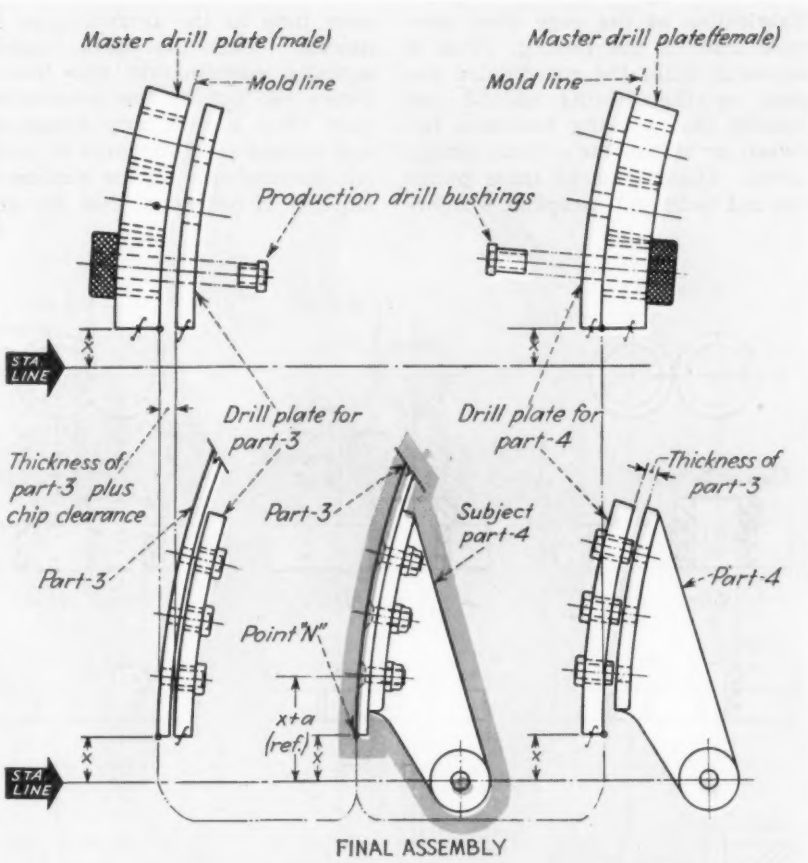
Discussion of methods for coordinating hole patterns through the use of match plates or master drill plates has been confined to those conditions wherein all holes are in the same plane. It is obvious that coordination of hole patterns not in the same plane must also be given consideration.

Coordination of full-size holes to permit direct assemblage on contoured surfaces present considerable design and application difficulties. As a result, the amount of planned direct assemblage under these conditions should be restricted or eliminated, if possible.

Because of difficulties that exist in transferring and accurately indicating centerline relationships of holes from various angular positions, use of match plates has been found to be impractical when contoured surfaces are involved. The reason becomes apparent when the effect of slight angular differences, as errors, are calculated and compared with the very small tolerance usually permitted for fit between structural hole tolerances and bolt diameters. Master drill plates prove to be satisfactory, since direct transfer of production bushing diameter holes can be accomplished. To control the same relative position of matching holes and maintain the exact angular line-up for the male and female master, it is necessary to bore for both bushing liners simultaneously.

Duplication of assembly and subassembly fixtures has made necessary a means of accurate reproduction of certain portions of this tooling. These portions are the fixture locating details which control the interchangeability of attachment points within the production unit. The duplication of these locating details involves considerable coordination between identical fixtures and related subassembly fixtures.

The most effective method of coordinating the relationship between these points requires the use of a master part or construction gage.



Production drill jigs are bored directly from the matched opposite of the master drill plate. Production parts drilled from jigs fabricated in this fashion will match within tolerances when assembled

The difficulties that exist in duplicating dimensions within tolerances required are based on the structural requirement of assembled units. Locating of critical points of interchangeability over the large span of length required must be accomplished by physical contact between surfaces. These surfaces on the construction gage represent the actual attach points of the production unit and, on the fixture, the corresponding locating details.

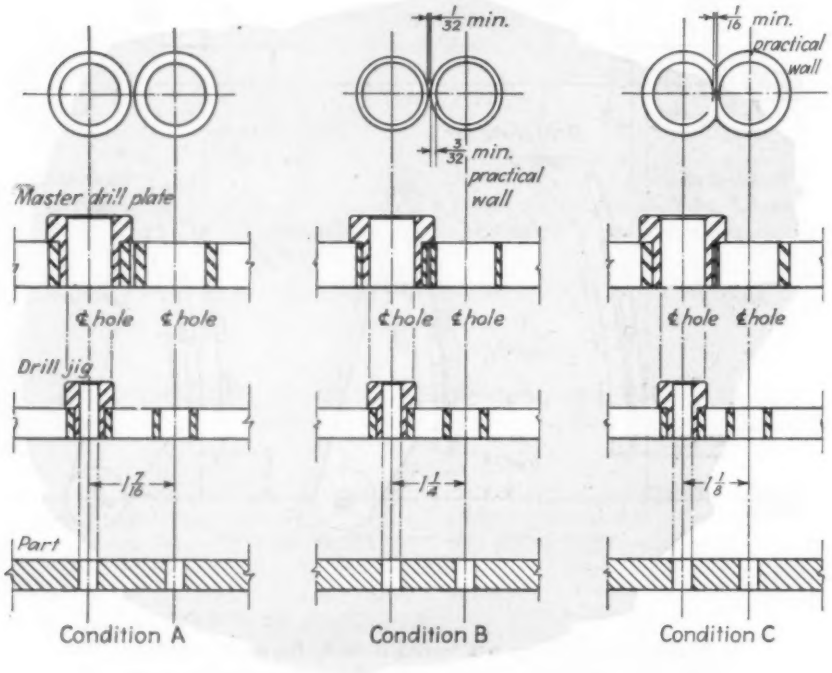
A construction gage is designed to locate or check only those portions of the production unit it is necessary to maintain. Designation of the necessary attach points is based on the jigging requirements of the fixtures it is to service.

Tolerances specified on the gage drawing for all dimensions not coordinated through other master tooling media are within engineering allowances. The standard tooling practice of using half the allowable tolerance is, wherever possible, disregarded. The major portions of available tolerances should be retained for manufacturing the production unit; it is therefore desirable to reduce the absorption of these tolerances by the gage to a minimum. The most desirable tolerance for construction gages is approximately ten percent of the allowable manufacturing range.

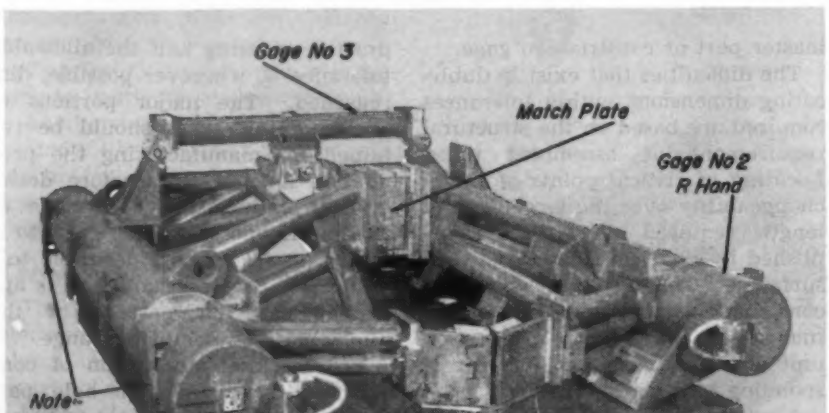
The working application of construction gages permits hole patterns, angles, and surfaces to be established by direct comparison. As a result, the construction gage is useful, not only in tool fabrication, but also for inspection and maintenance of tooling.

When coordination of tooling is a recognized necessity at the start of a tooling program, the design of construction gages must be scheduled for the same period as that of the tool or tools it is to service.

Fabrication of the gage must precede that of the tooling. This is essential, since the coordinated design of the tooling should not specify any working tolerance between or within the critical tooling areas. Dimensions of these points are not indicated except as a reference note to the correct gage required. This procedure, besides actually coordinating the tooling, forces the use of the construction gage since no working dimensions are available. Functional or physical interference can be eliminated, since it is necessary that the gage fit into the fixture as a master part.



Master drill plates are limited only by the conditions imposed by the physical proportions of the hole pattern. Where the use of master drill plates becomes impractical, match plates should be used



Coordinated construction gages can be assembled together to simulate part assemblies. Each construction gage automatically becomes an inspection gage for its opposite mating gage

Existence of "fixture tooling," prior to any attempt of coordination or the need of duplicated tooling because of production requirements, is a condition often found in expansion of manufacturing facilities. As a result of this condition, construction gages are sometimes set up from assembly fixtures that are proved to produce units of satisfactory dimensional accuracy. Admittedly, this is a reversal of the usual practice, but, under these circumstances, is the most practical solution. The resultant effect becomes a transmittal of the existing dimensional conditions which, if within engineering allowables, is basically the same as coordination from the start.

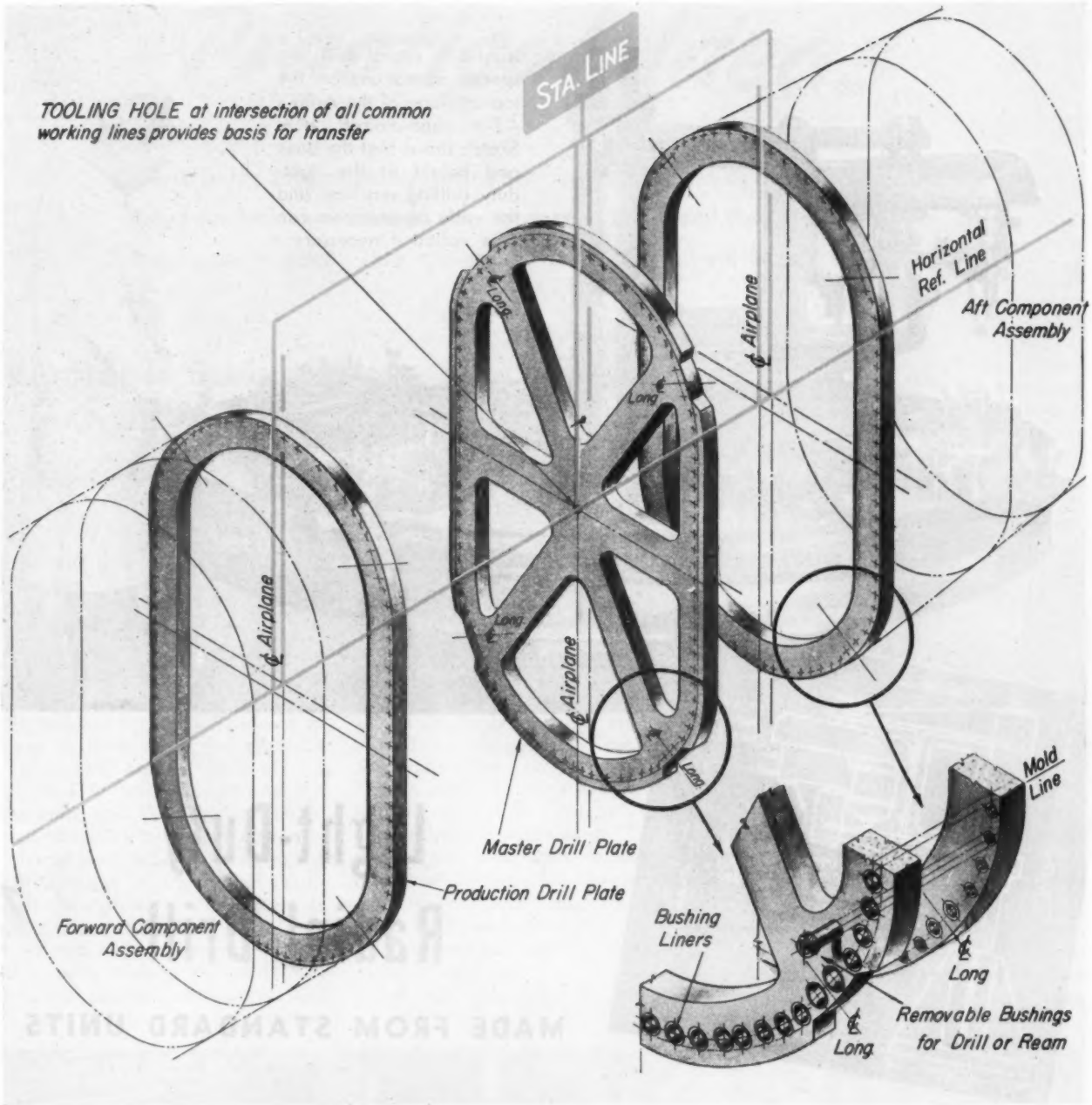
Use of Construction Gages

On large component assemblies, the use of inspection gages is not too successful. The physical proportions of large assemblies often require gages having removable locators or gage bars. The structural requirements necessary for accuracy of large gage units are usually restricted by physical limitations imposed by handling facilities or the type of construction used in the assemblies. This necessarily leads to dimensionally unstable inspection gages. Therefore, the establishment of the critical points by construction gages insures initial accuracy of the fixtures and at the same time provides a satisfactory method of maintaining the continued successful operation through periodic checking.

The extent of practical usage for master tooling cannot be too clearly defined. As a result, some tooling divisions have, in some instances, provided certain phases of master tooling beyond practical limits. This is particularly true in the application of construction gages. A large factor, perhaps the greatest, contributing to this "too extensive application" is incomplete planning and preparation of the entire master tooling program.

Complete Analysis Stressed

Since production will not allow cost considerations to become secondary, use of master tooling must become limited and ultimate in its application, hence, the emphasis on complete and predetermined analysis of its application. Tool engineering forms the keynote for initial control of interchangeability and the measures taken to insure this result through the production tooling must



A master drill plate is used to coordinate production drill jigs. By this method of referring all attaching points of related assemblies to a common reference base, reproduction of tolerances within limits of interchangeability is assured

arise from and be based upon the following factors:

Production Requirements

(a) Ratio between production rate and interchangeability specifications.

The latter should be analyzed and control the basis for included tooling costs. Where the amount of production is limited, interchangeability, except for the major components, should not assume too great importance and tooling costs may be governed accordingly.

(b) Type of Equipment Manufactured

Functional operation of the product and the necessity for field replacements may affect interchangeability requirements, thereby affecting the tooling coordination requirements. (This factor also exists as part of the engineering requirements.)

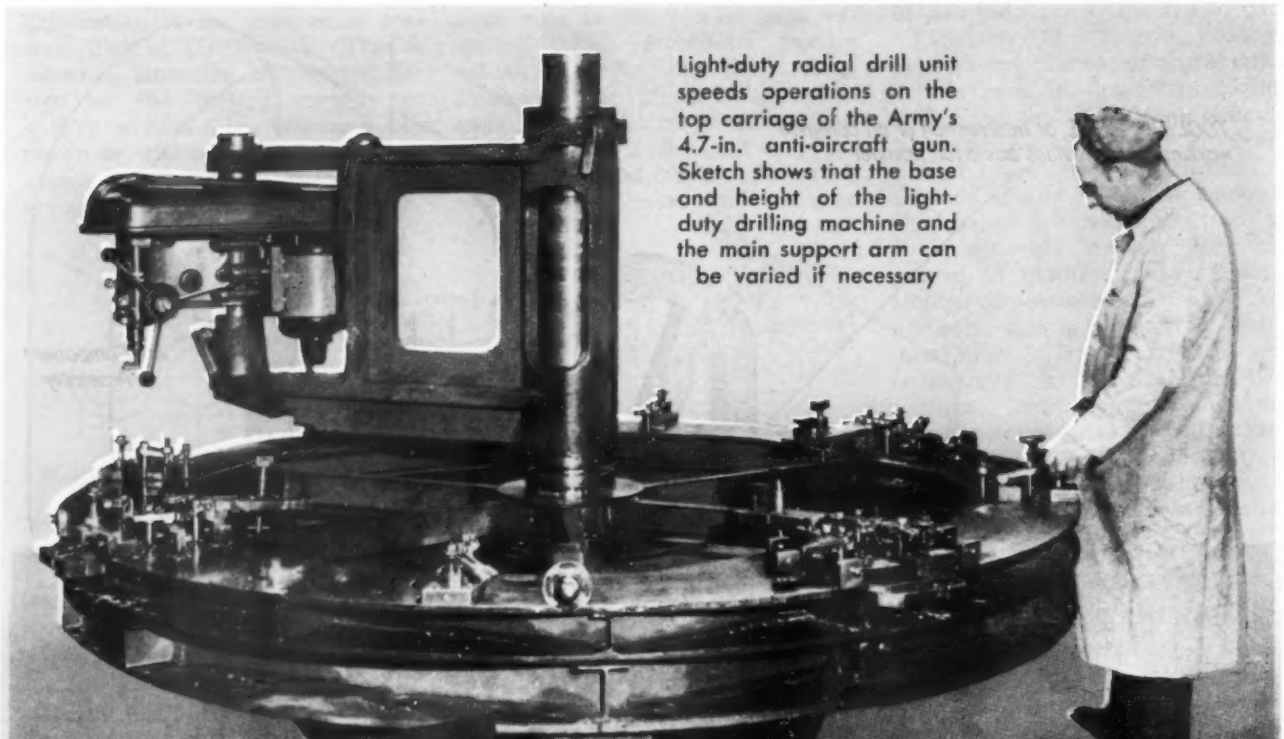
Engineering Requirements

(a) Production Breakdown of Component Assemblies

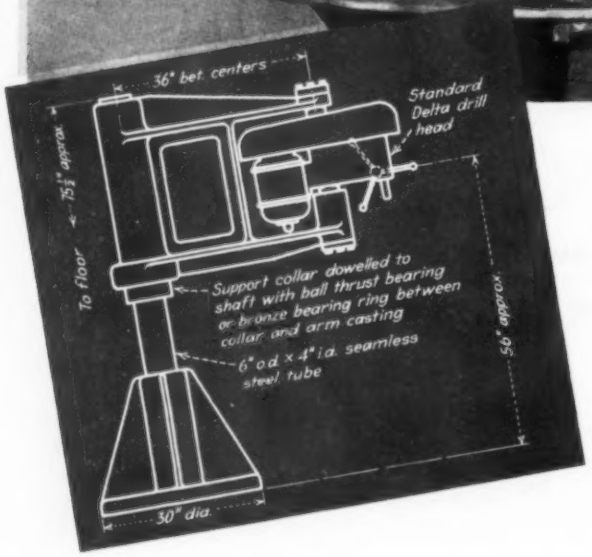
This analysis is the most concrete division of the various complete elements necessary, and therefore, forms the basis for mandatory coordination areas and the essential master tooling.

(b) Establishment of Suitable Tolerances for Production

The use of liberal tolerances within the practical limits controls the production value of component assemblies. This factor indirectly dictates both the extent and the type of master tooling required to produce interchangeable parts within given economic considerations. Consideration of suitable production tolerances in the initial phase of engineering development can eliminate many conditions which may otherwise be controlled only through extensive master tooling.



Light-duty radial drill unit speeds operations on the top carriage of the Army's 4.7-in. anti-aircraft gun. Sketch shows that the base and height of the light-duty drilling machine and the main support arm can be varied if necessary


36" bet. centers
Standard Delta drill head
To floor
75½" approx
Support collar dowelled to shaft with ball thrust bearing or bronze bearing ring between collar and arm casting
6" o.d. x 4" i.d. seamless steel tube
56" approx
30" dia.

Light-Duty Radial Drill

MADE FROM STANDARD UNITS

ORIGINATED to fill a wartime need for a light-duty radial drill press at a time when standard radial drills were virtually unobtainable, the unit shown in the accompanying illustrations has found considerable application in Fisher Body's Grand Rapids Stamping Division plant. Essentially, it consists of a standard drill head, complete with motor drive and electrical controls, mounted on a special stand having a cast-iron arm which can be moved radially around a vertical column made from a section of 6-in. outside diameter seamless steel tubing. The cast-iron arm provides ample clearance to swing the drill head around the 3½-in. diameter vertical shaft on which it is mounted.

The zone of operations of the drill spindle lies within a circle having a radius of approximately 38¼ in. and it is possible to use the drill anywhere within that radius to a minimum distance of approximately 28 in. from the center of the vertical column on which the arm is mounted. Distance between the drill head and the floor, of course, depends upon the length of steel tube used for the main column, as well as the size and type of base casting used. The entire unit can be assembled on top of a drill jig, or it can be mounted on a floor-type base.

The illustrated set-up was developed for drilling and tapping the top carriage of a 4.7-in. anti-aircraft gun for the attachment of a bronze roller thrust bearing retainer. In another set-up at the Grand Rapids Stamping Division plant, three of these units are employed for drilling and tapping operations on parts set-up in three adjacent drill jigs. In this arrangement the center unit is used for drilling in all three jigs, while the two outside units have gear reduction drives to the spindles and are equipped with tapping heads. One of these units is used for tapping 14 holes in a part held in an adjacent jig, while the other unit taps all holes in two adjacent jigs. This set-up eliminates the need for changing tools in the machine spindles, and at the same time makes it possible to have the three operations performed by two men.

Practical Ideas

★ **War-Winning Suggestions appearing here were recognized as meritorious by the Board for Individual Awards, War Production Drive, and the Navy Employees' Suggestion Program. They are offered to industry to aid in war production** ★

Adjustable Swivel Plate Simplifies Grinding of Cams for Automatics

BY RAYMOND L. SINGLER
Packard Motor Car Company

An angle plate with an adjustable swivel plate attached has proved useful when setting up various sizes of control cams for regrinding. The cams are used on Cleveland automatics to control the action of the cutting tools.

The method formerly followed in setting up these cams for regrinding is shown below. Two clamps were used to hold the cam to the angle plate and the required angle was obtained by placing a sine bar, which had been set previously to the required angle, on the straight surface of the cam. The top surface of the sine bar was then indicated from end to end and adjustments made until a zero reading was obtained. When the clamps were tightened, however, the cam had a tendency to move, thus changing the setting. The tolerance on these angles is plus or minus 0 deg. 1 min., therefore the method proved a long and tedious one.

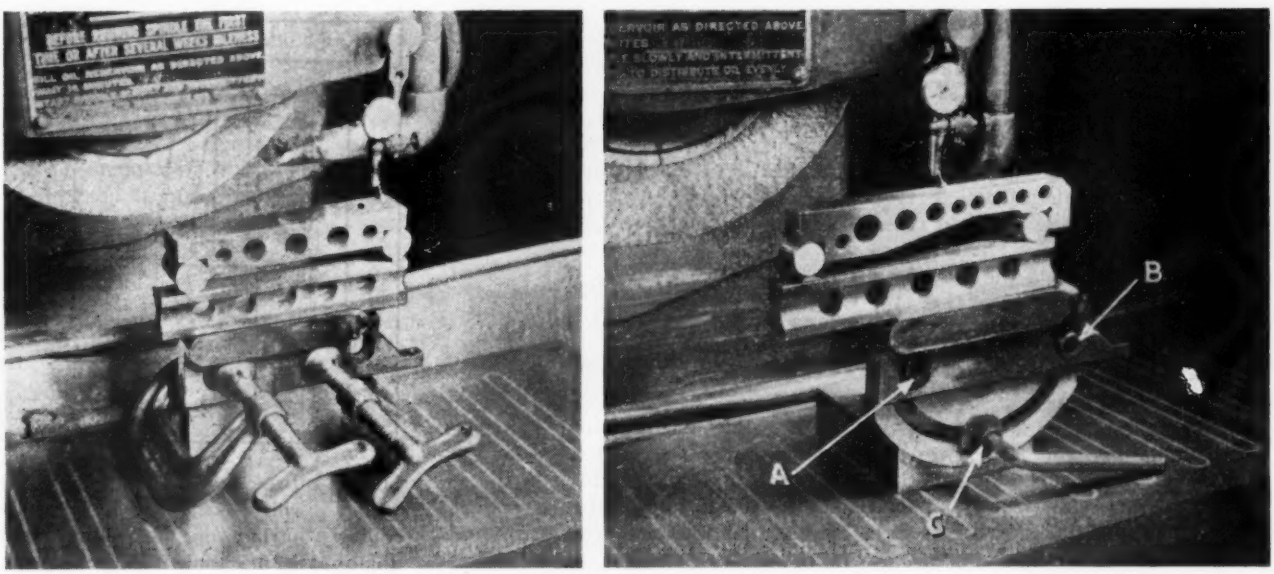
In order to speed up these operations an angle with an adjustable swivel was designed, as shown at the right. The cam is held to the swivel plate by two setscrews, *A* and *B*, that are tightened before any setting is attempted. The required angle is then obtained by means of the sine bar, as described previously. When the adjustments have been completed the setscrew *C* is tightened, locking the swivel plate in position.

Average time required to regrind one cam by the previous method was five hours, while the time now required with the new method is two hours. There are three cams to be reground each day, therefore approximately 2,565 man-hours and a corresponding amount of machine hours are available for other work each year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

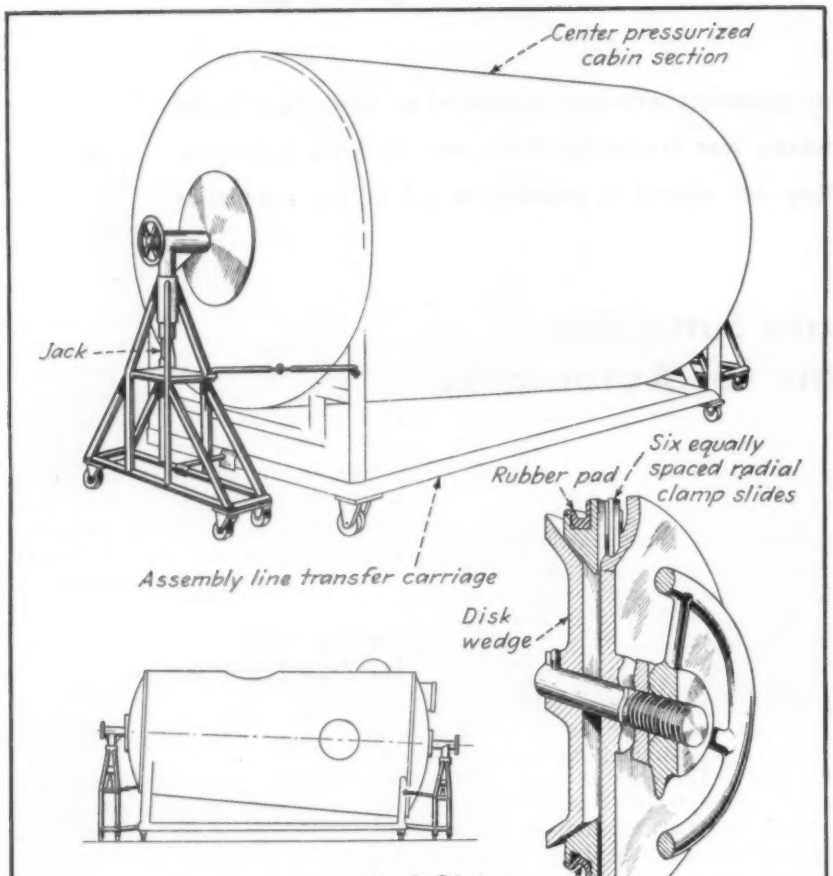
Turning Jacks For B-29 Cabin Section

BY PETER KETELSEN
Boeing Airplane Company, Wichita Division

During the assembly of the center pressurized cabin fuselage section for the B-29 Superfortress bomber at the plant of the Wichita Division of the company, it is necessary to turn this unit 180 deg. about its longitudinal axis and replace it on its assembly carriage. For this turning operation a jack carriage has been designed which incorporates a novel work clamping



Addition of an adjustable swivel plate to the angle plate used in regrinding control cams has reduced the time for grinding from five to two hours per cam and saved 2,565 man and machine hours a year



Turning jacks for the center pressurized cabin fuselage section of the B-29 bomber have simple clamping units which fit into hatchway openings at each end of the cabin subassembly. Rubber pads protect the edges of the openings when these units are clamped in place

device. Two of these carriages are used, one being clamped at each end of the assembly in a large hatch hole.

As indicated in the accompanying illustration, a turning jack carriage is clamped at each end of the fuselage section, then a small hand-operated jack on each of the two carriages is operated to raise the assembly off the transfer carriage. After turning the assembly 180 deg., the jacks are lowered to replace the cabin on its carriage.

Each of the clamps is operated by a large handwheel. Turning this handwheel pulls a large tapered disk wedge against six equally spaced radial clamp slides which are grooved to fit the contour of the hatch opening in the end of the cabin. A rubber pad is fitted into each of the clamp slide grooves to protect the aluminum skin surfaces on the cabin assembly. Positive stops prevent the radial clamp slides from falling out of the clamp assembly, and springs are used to return the slides when the disk wedge is returned to its original position.

Roller Cutter Tool Cuts Fuel Line Tubing Without Burring

BY HENRY J. CASTENS
American Stove Company

A roller cutting tool has been made to replace hacksaws for cutting off any excess tubing in the assembly of 58-gallon auxiliary droppable fuel tanks. Formerly in cutting off the tubing with a hacksaw severe internal and external burring occurred, and often the adjacent surface of the tanks was damaged.

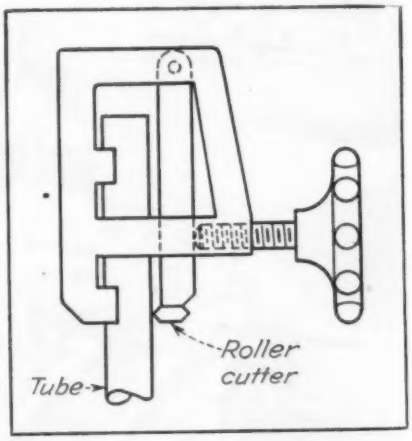
The new cutting tool consists of a roller cutter mounted in a metal frame, which holds the cutter parallel to the surface of the tanks. The tool is slipped over the tube and pressure is applied to the cutter by the thumbscrew. The tool is then rotated on its axis, which coincides with the center line of the tube being cut. The tool makes a clean cut, with no burring and without damage to the tank of which the tube is a part. Women have become adept in the use of the new tool. Previous operations using hacksaws were performed by men. The time for the cutting-off operations has been reduced approximately one-half. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Stop for Engine Lathe Cross-Slide Useful in Small Shop Work

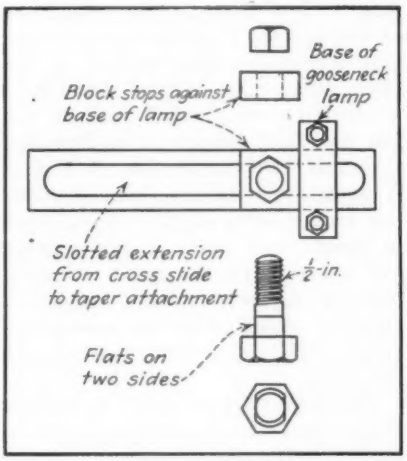
BY DONALD R. TRYER

A square block bolted to the slotted extension of the cross-slide of the taper attachment of an engine lathe has been satisfactory as a stop when chasing threads on production work in a small shop.

The threading tool is adjusted in the usual manner prior to making the first cut. The block is pushed up firmly against the base of the extension lamp and bolted in place. After a cut has been made and the cross-slide has returned for the next



Cutting off excess lengths of fuel-tank tubing with hacksaws frequently caused burring of the tubing and damage to the tanks. This has been eliminated by a roller cutting tool and the time has been reduced one-half of that required formerly


Base of gooseneck lamp
Block stops against base of lamp
Slotted extension from cross slide to taper attachment
½-in.
Flats on two sides

A block used as a stop on the cross-slide of an engine lathe has materially increased production of thread-chasing work and also proved useful in other types of production in a small shop

cut, the tool is stopped automatically in the original position, with no reference required to the micrometer of the cross-slide. The threading tool is then fed in with the compound. This arrangement has also been used with the turret toolpost for a job that required turning, necking, chamfering and threading. Each tool can be adjusted so that the final cut is made with the block in the "stop" position.

The foregoing method may not prove so satisfactory where close tolerance is required, as there is a variation of 0.003 or 0.004 in., plus or minus, at times, but as a general rule close tolerances can be held. Use of the stop for work requiring common scale measurements has brought about a production increase of as much as 15 percent, although actual results depend to a great extent upon how many operations are involved.

Boring-Bar Support Avoids Resetting Work on Radial Drill

BY CARL C. WARDEN
Permanente Metals Corporation
Richmond, Calif.

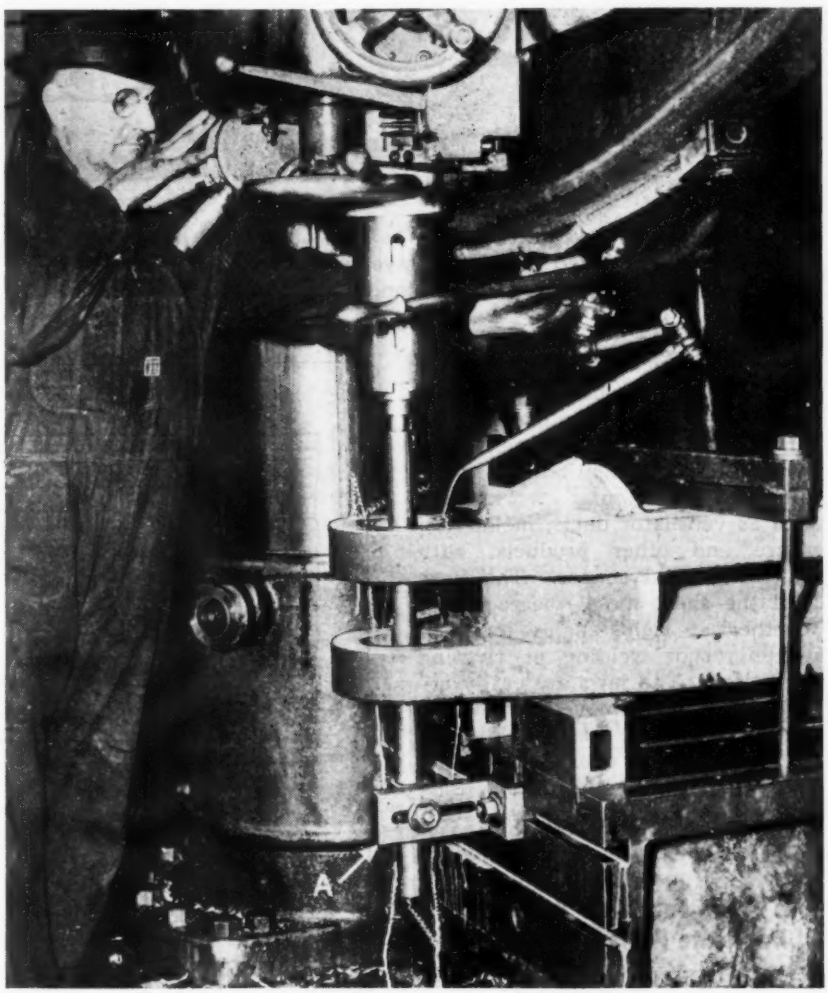
When flycutting on a radial drill press it was necessary to position the work to the tool for each operation, which took considerable time and brawn to accomplish. Development of an adjustable bearing to furnish rigid support for the lower end of the boring bar, as shown at *A*, has made it possible to make several cuts at different points on a workpiece without moving it. By positioning the tool to the work, all boring operations are now performed with the workpiece in a fixed position. The bearing bracket can be moved along the box table and bolted at any desired point with respect to the work.

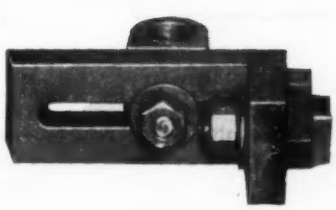
Positioning the tool to the work, instead of the work to the tool, is done much more easily and in less time than was required formerly. More accuracy is obtained in machining than was true when heavy parts had to be repositioned for each operation. Approximately 100 man-hours per month are saved by the use of this device. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Plier Vise Attachment Facilitates Welding of Rectangular Parts

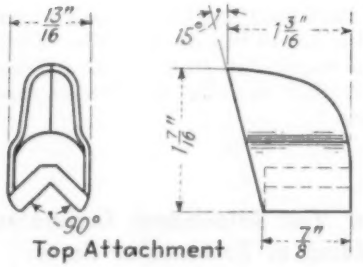
BY HOWARD J. BEHYMER
Puget Sound Navy Yard

Addition to a "Snap-on" plier vise of a substitute pair of jaws specially designed to hold rectangular parts at an angle of 90 deg. has simplified welding and riveting of such parts. The details of the special jaws and

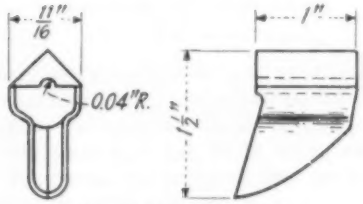




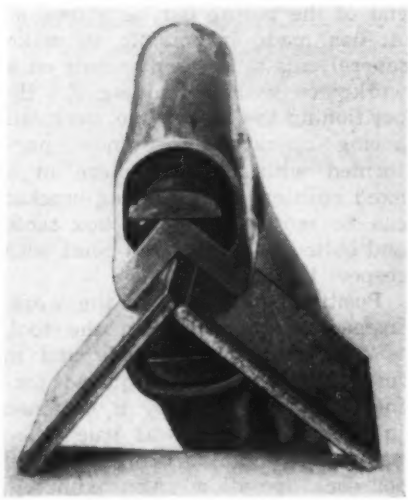
An outboard bearing *A* for the boring bar can be fastened at any desired point on the table and several cuts can be made on a workpiece without moving it

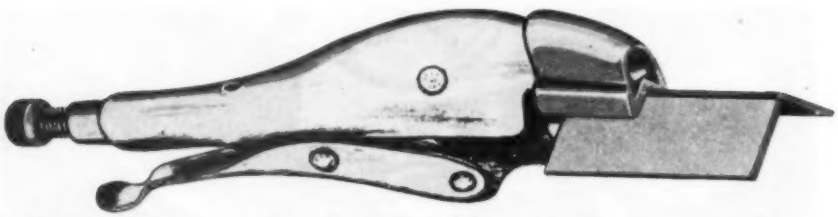


Top Attachment



Bottom Attachment





Addition of special jaws to a plier vise to hold parts at 90 deg. for welding or riveting has facilitated such work on ventilator ducts, metal furniture and similar products with rectangular or odd shapes

method of attaching them to a pair of vise pliers are shown.

The jaws are easy to construct at small cost. Their attachment to a plier vise greatly facilitates the handling of rectangular workpieces, such as ventilator ducts, metal furniture and other products, with angular or odd shapes. The jaws hold the sheet metal pieces firmly together at right angles for tack welding, spot welding or riveting operations. The jaws are easily attached to or removed from the pliers. Their use has repaid their cost many times over. *Suggestion Submitted Under the Navy Employees' Suggestion Program.*

Vise Stops Facilitate Production Of Duplicate Parts

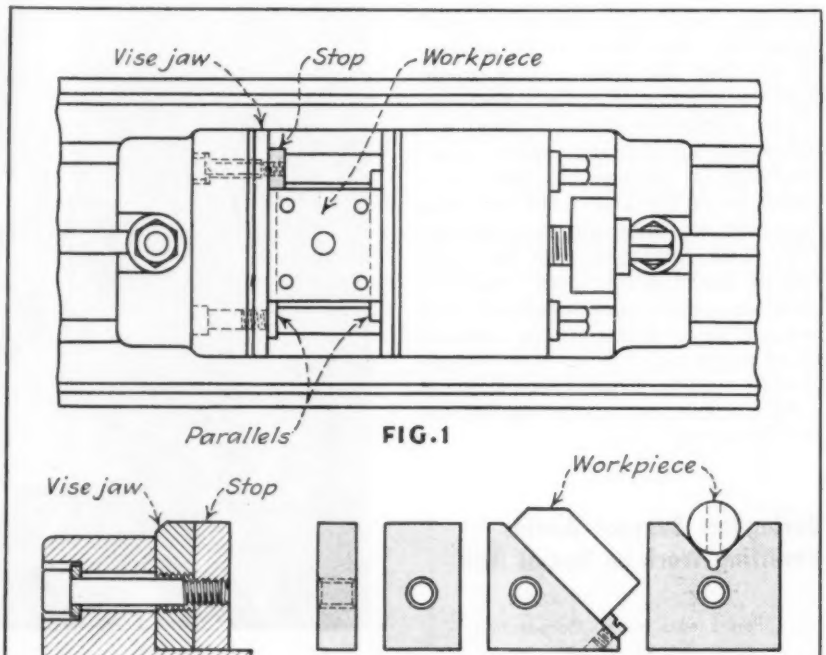
BY FRITZ L. KELLER

A stop on a vise is helpful when drilling or milling duplicate parts. For this kind of work the stops shown in Figs. 1, 2 and 3 have been found easy to construct, inexpensive and can be quickly attached to a vise.

When a job comes up where a stop may be used to advantage, one of the screws holding a jaw of the vise is removed and replaced by another screw that is small enough to go through the tapped hole in the jaw and long enough to be threaded into the stop, as shown in Fig. 2. A spacer, or washer, is placed under the socket head of the screw, since in most cases there is not enough overlap to give the head sufficient bearing surface for the necessary rigidity. Addition of the washer insures sufficient holding power for the work.

The stops may be made in various shapes and sizes to suit the work on hand. A few types that may prove advantageous are shown in Fig. 3.

Stop *A* is the type used ordinarily for work as shown in Fig. 1. However, *B* provides the same facilities as *A* and in addition is good for holding work at an angle of 45 deg. Stop *C* can be used for general work, the same as *A* and in addition may be used in clamping round parts in the V-shaped stop. The types of stops shown may also be used in pairs set in opposite directions as may be necessary, especially on long parts.



Addition of stops to a vise has proved advantageous in the production of duplicate parts of square, angular and round shapes for milling and drilling operations

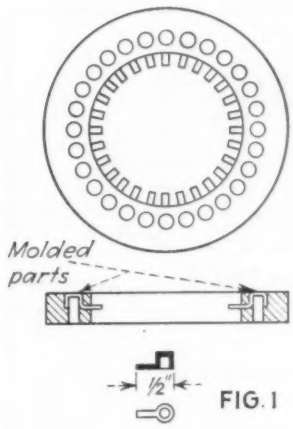


FIG. 1

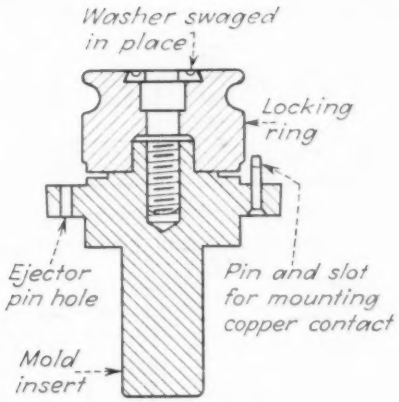


FIG. 2

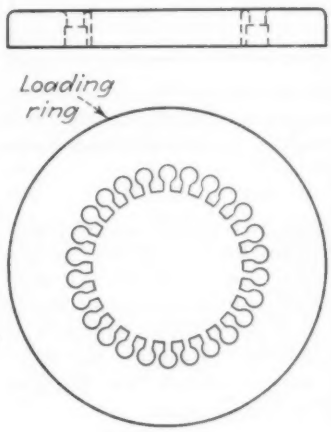


FIG. 3

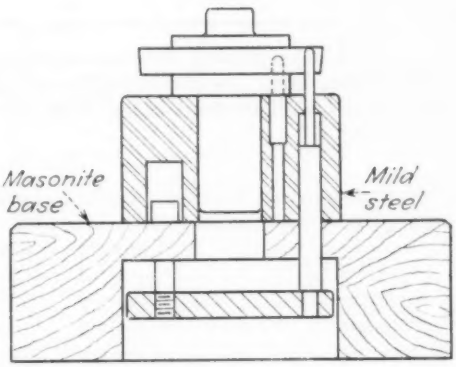


FIG. 4

The design of a removable insert, loading and locking rings for a plastic molding operation which included a large quantity of small copper contacts, not only made handling of the small parts easier, but brought about considerable saving of time

Molding of Small Plastic Parts Facilitated by Special Fixtures

BY HARRY G. WESSEL
Westinghouse Airbrake Company

Consideration of the smallest details of tools and fixtures saves time in molding a large quantity of small plastic parts. The part, Fig. 1, has been in production at the Westinghouse Airbrake Company plant for the past two years, as well as in several other plants, because of the large quantities urgently needed to meet Army and Navy requirements.

Four semi-automatic presses, each operating a six-cavity mold, are in production on this part. Each press has a capacity of 2,000 molded parts each 24 hours, a total of 8,000 parts per day, or over 2,500,000 a year. The part has 26 copper contacts which are molded in accurate relation to other details of the finished piece. This requires the handling of over 65,000,000 of these small contacts, each of which has to be placed accurately in the mold by hand.

It was found that removable inserts were necessary to facilitate loading these 156 copper contacts in the mold. This insert, Fig. 2, is provided with ejector pin holes for removing the molded part. To keep the press in continuous operation twelve of these removable inserts were made for each mold. While six of them were in the mold when the parts were being cured, the other six were being loaded thereby insuring practically continuous operation of the press. Since the complete molding cycle was less than five minutes it was necessary to remove the finished parts from the mold inserts, clean the excess molding compound from them, reload 156 parts in proper position and clamp them in place in the same period of time. All of the mold parts were heated to 325 F., due to contact with the mold.

The original method of loading the 26 copper contacts was to pick up the small contacts between the thumb and forefinger and place them on the pin and in the slot provided in the insert. This was a tedious operation because of the heated condition of the mold and the small size of the parts. It was almost impossible to put these 26 contacts in place without touching the hot mold insert, which pushed the contacts out of position. After the contacts had been inserted, they were clamped firmly by means of a locking ring held in place by means of a socket-head capscrew. A regular L-type hexagon socket screw wrench was used.

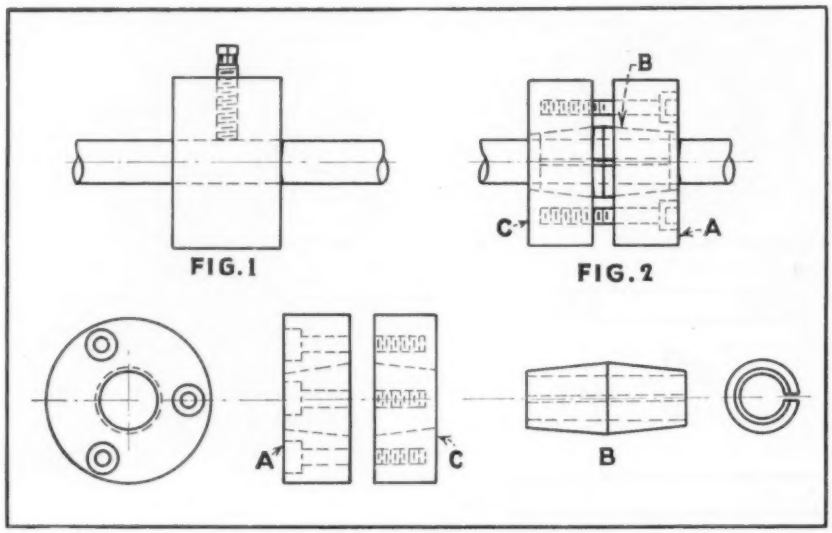
Difficulty in setting the copper contacts in place was overcome by use of a loading ring, Fig. 3. This ring has 26 holes of the same shape as the coper contact, large enough to permit the contact to drop through freely. It is set in position on the mold insert and the copper contacts are dropped through the holes and put in place on the pins and slots. Several of these rings were provided for each operator and used alternately to prevent them from heating from contact with the heated mold insert. It soon became a simple operation to drop the contacts in place and clamp them before removing the loading ring.

The locking ring and capscrew were combined into one unit, Fig. 2. This was done by providing an undercut counterbore in the locking ring, inserting the socket-head capscrew and swaging a washer into the undercut counterbore. Sufficient clearance was provided between the washer and the screwhead to permit the capscrew to turn freely. The L-type wrench was replaced by one of T-shape.

In order to handle the hot inserts after removing them from the mold, twelve loading jigs were made, Fig. 4. The press operator placed the inserts in six of these jigs, which were kept in position alongside of the press. The other six were on a bench, where other operators were leading the copper contacts in the inserts. The base of the jigs was made of Masonite to prevent heating, while the upper portion was

made of a mild steel. A pin in this steel portion matched with a hole in the mold insert, preventing it from turning while loosening or tightening the locking ring screw. Ejector pins mounted on a stripper plate in this jig removed the molded part from the inserts.

The jig was placed in position on a bench through which a round steel rod was actuated by a foot lever, and the rod, by striking the stripper plate, removed the molded part. The jigs were then moved along the bench to other operators who loaded the copper contacts in place on the mold inserts. The hot inserts always remained in the jigs until replaced in the mold by the press operator. These six jigs remained at the molding press until the molding cycle was completed and the operation repeated. Suitable arrangements were provided on the bench to prevent the jigs from lifting while the part was being removed and replaced. These few fixtures reduced the number of operators required and at the same time gave a high rate of production.



Danger of a protruding setscrew and other disadvantages of the ordinary type of stop collar are eliminated by a type composed of a split bushing and two collars with tapered holes, held by capscrews in counterbored holes

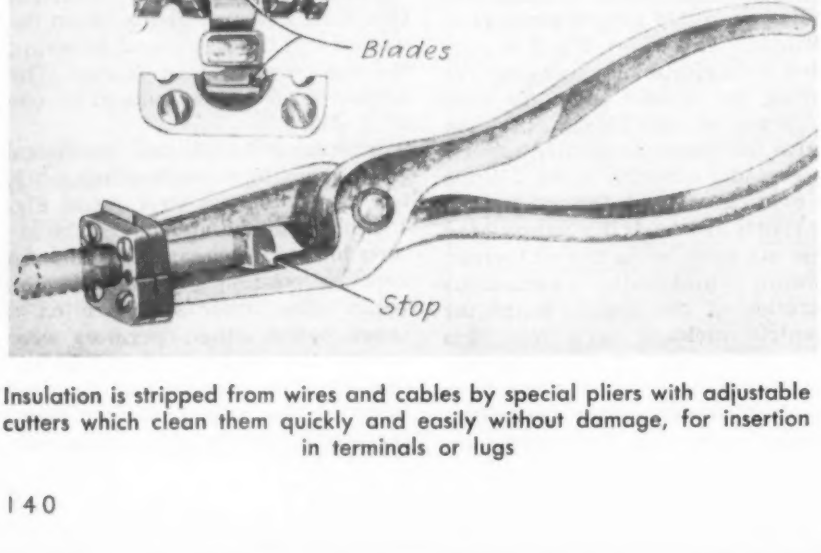
Easily Removable Stop Collar With Countersunk Capscrews

BY MICHAEL AXLER

The ordinary type of stop collar, held in place by a setscrew, leaves a burr on the shaft when tightened, and the projecting head of the setscrew is always a potential source of accident. It is usually necessary to use a hammer when moving a collar of this type to another location.

A stop collar which will fit snugly on a shaft and which has none of the disadvantages of the setscrew type consists of two separate collars with tapered bored holes, as shown at *A* and *C* and a tapered split bushing as shown at *B*. The section *C* has blind holes which are drilled and tapped. In section *A* the holes are drilled through and counterbored to take two Allen capscrews, as shown in the assembled section.

The stop collar is assembled on a shaft by inserting the split bushing between the two collars and tightening the three parts together by the capscrews. The taper of the collars tightens the split tapered bushing on the shaft. The collar can be released by loosening the capscrews which allows the tapered bushing to spring open.



Insulation is stripped from wires and cables by special pliers with adjustable cutters which clean them quickly and easily without damage, for insertion in terminals or lugs

Insulation Stripping Tool Eliminates Wire Damage

BY J. J. NELSON

Kaiser Company, Vancouver, Wash.

When ends of wires or cables were stripped of insulation for insertion in terminals, the work was formerly done in this plant with pocket knives. The wires were frequently damaged.

Elimination of these difficulties was accomplished by specially designed wire strippers, which have adjustable knives. The wire is placed in the jaws of the tool, as far as a copper stop will allow. This stop can be brazed at any desired point within the range of the tool. The pliers are equipped with blades made from a hacksaw blade. Distance between blades can be adjusted so that pressure on the pliers closes them to the extent necessary to cut the insulation, but not the wire. The pliers are given one twist and pulled, which removes the insulation and leaves the wire clean and undamaged. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Simple Indexing of Any Angle—III

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

N=Holes per Division. *D*=Appropriate Hole Circle

Turn	0	1	2	3	4	5	6	7	8	9
	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
.100	20 200					20 199	17 169	15 149	13 129	11 109
.101	10 99	9 89		8 79	7 69	20 197	19 187	18 177	17 167	16 157
.102	15 147		14 137		13 127		12 117		11 107	18 175
.103		10 97			6 58		20 193		19 183	8 77
.104	18 173		15 144	17 163		21 201	16 153	20 191		15 143
.105	21 200			18 171		21 199	19 180	13 123	20 189	
.106	16 151	19 179	12 113		15 141	18 169	21 197		11 103	20 187
.107		3 28		19 177	16 149	10 93			18 167	15 139
.108		12 111		17 157	9 83	14 129	19 175	5 46	21 193	11 101
.109			13 119	20 183	22 201	15 137	8 73		19 173	10 91
.110	22 200	12 109	14 127		18 163	22 199				
.111		21 189						22 197	18 161	16 143
.112			11 98	21 187	19 169		17 151	8 71	15 133	7 62
.113	20 177		18 159		11 97	16 141	5 44		19 167	9 79
.114	22 193	17 149		20 175	23 201	15 131	18 157		21 183	10 87
.115	23 200	16 139	22 191		3 26		23 199	14 121		8 69
.116	21 181			15 129	22 189	12 103	19 163	23 197	16 137	9 77
.117	20 171	13 111		21 179			22 187			
.118	19 161	17 144		20 169			21 177		12 101	17 143
.119	5 42		23 193	13 109	24 201	19 159		14 117	20 167	
.120	24 200		22 183	16 133	23 191	10 83	24 199	7 58	18 149	11 91
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.122	15 123	16 131	22 180	17 139	6 49			20 163	21 171	22 179
.123	23 187			9 73	18 147	10 81	11 89	12 97		14 113
.124	16 129	17 137	20 161	24 193	25 201					
.125	25 200						25 199	24 191	20 159	18 143
.126	16 127	14 111	13 103		11 87		10 79		9 71	25 197
.127	24 189	23 181	22 173		20 157	19 149		18 141	23 180	
.128			15 117	24 187	14 109	23 179		22 171	21 163	
.129	8 62			26 201		25 193	14 108		17 131	23 177
.130	26 200	16 123	22 169		21 161		26 199	20 153	14 107	25 191
.131		24 183		13 99	23 175		5 38	22 167	17 129	19 144
.132	26 197	21 159	16 121	25 189		20 151	24 181	13 98	15 113	23 173
.133				24 180				25 187	21 157	17 127
.134	13 97	24 179	20 149	27 201		23 171		26 193	19 141	
.135	27 200	15 111		18 133			24 177	27 199	11 81	14 103
.136		26 191			6 44		25 183	19 139		
.137	27 197	24 175		21 153	18 131		26 189	23 167		8 58
.138		25 181	17 123		22 159		14 101	24 173		25 180
.139	26 187	21 151	11 79	28 201		18 129		25 179	13 93	27 193
.140	28 200	22 157	15 107	24 171		17 121		28 199	10 71	21 149
.141		23 163	25 177		27 191		16 113	18 127	20 141	
.142	24 169	26 183								27 189
.143								26 181	22 153	20 139
.144		16 111		29 201	27 187	25 173	12 83	23 159		10 69
.145	29 200	28 193	26 179	17 117			15 103	29 199	21 144	
.146	20 137	13 89	25 171	18 123		23 157	28 191			26 177
.147		5 34	29 197	19 129		27 183		22 149		25 169
.148		28 189	12 81			15 101	26 175		18 121	21 141
.149		24 161	30 201		13 87	16 107	19 127	28 187		

N=Holes per Division. *D*=Appropriate Hole Circle

Turn	0	1	2	3	4	5	6	7	8	9
	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
.150	30 200		29 193	26 173	20 133	14 93		30 199	27 179	24 159
.151		21 139		18 119		10 66			29 191	
.152	26 171		7 46	30 197		27 177		20 131	22 144	24 157
.153	28 183	15 98	17 111	21 137	29 189				26 169	22 143
.154			31 201	27 175	23 149	19 123	15 97	28 181		11 71
.155	31 200	29 187	9 58	25 161	30 193		28 180	26 167	31 199	
.156	22 141	27 173	5 32	5 32	28 179	23 147	13 83			24 153
.157	19 121	30 191	25 159	31 197	17 108	20 127				27 171
.158			28 177	21 133	16 101	29 183		30 189		24 151
.159		7 44	32 201	18 113	11 69	26 163		19 119	27 169	
.160	32 200		29 181	21 131	30 187	13 81	31 193		32 199	14 87
.161		29 180		10 62		26 161	16 99	27 167	28 173	
.162	29 179		18 111	31 191	33 197		20 123		21 129	
.163		23 141		24 147	25 153	26 159		28 171	29 177	30 183
.164	31 189		33 201		12 73		13 79		15 91	16 97
.165	33 200	18 109		20 121	22 133	23 139	27 163	29 175	33 199	
.166								30 180		
.167						33 197	32 191	28 167	25 149	23 137
.168		20 119	18 107	17 101		15 89		14 83	13 77	
.169	12 71	34 201		32 189	31 183	30 177	29 171		27 159	26 153
.170	34 200	25 147	24 141			22 129		21 123	34 199	
.171	33 193	32 187	19 111	31 181	30 175		29 169	17 99	28 163	
.172	27 157	31 180	26 151		10 58		34 197	24 139	33 191	33 133
.173			31 179		30 173	17 98	25 144	29 167		28 161
.174		35 201		19 109		26 149	33 189		25 144	32 183
.175	35 201	31 177	24 137	17 97	30 171		23 131		16 91	35 199
.176		34 193				33 187			32 181	26 147
.177	20 113	31 175	14 179	25 141	11 62	30 169	19 107	35 197	32 180	29 163
.178	34 191		18 101	28 157			5 28		32 179	22 123
.179		36 201	31 173			21 117	30 167		16 89	34 189
.180	36 200	29 161	20 111	33 183		24 133	26 144	15 83	32 177	36 199
.181		23 127	27 149	35 193					34 187	
.182				33 181	29 159	25 137		36 197		32 175
.183	28 153	13 71	24 131	35 191	31 169	20 109		27 147		16 87
.184		37 201	7 38		33 179	19 103		29 157		22 119
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.187	26 139	32 171	35 187			27 144			37 197	34 181
.188	25 133	19 101			13 69	36 191	33 175	30 159	27 143	34 180
.189	38 201		21 111	32 169		29 153		11 58	26 137	34 179
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.191	17 89	30 157	35 183			27 141	32 167	37 193	14 73	19 99
.192		34 177		5 26		36 187		21 109	16 83	38 197
.193	33 171			35 181		12 62		37 191	25 129	19 98
.194	39 201		27 139	34 175	35 180		29 149	22 113	15 77	
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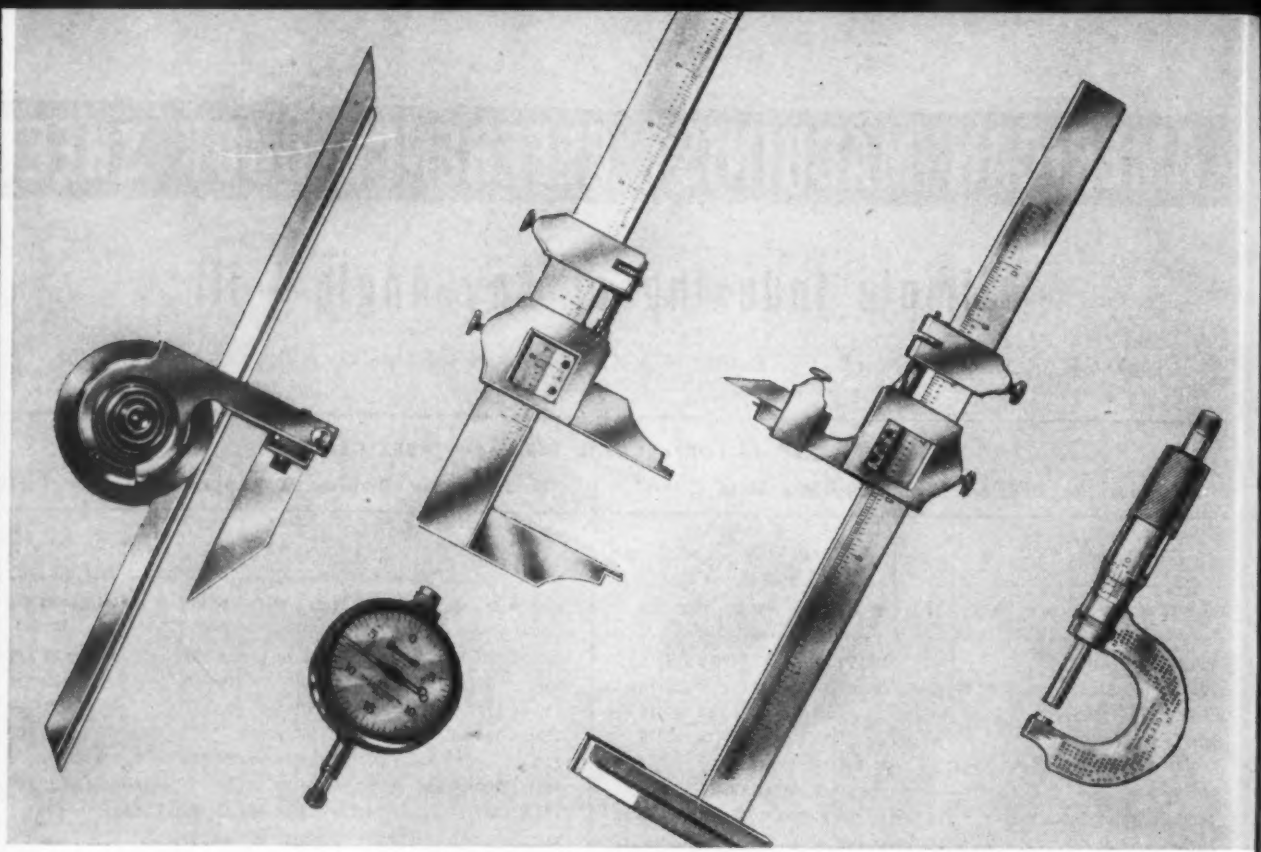
.197		27 137	14 71	29 147		31 157		35 177	18 91	37 187
.198	39 197		22 111	24 121		26 131	28 141	30 151	34 171	36 181
.199	38 191									

STARRETT TOOLS



STARRETT TOOLS

Measure Up to YOUR Own High Standards of Accuracy and Performance

You've probably been going through the same experience as most of us in the metal working industry. You've had to turn out products meeting extra high standards of precision and turn out more of them per day or per year than you ever dreamed you could.

In the face of an almost overwhelming demand for precision measuring tools to meet these extreme production demands, the accuracy and dependability of Starrett Tools have been steadfastly maintained.

The Starrett name on a Micrometer, a Vernier Gage, a Dial Indicator or any of hundreds of other precision measuring tools is and will continue to be worthy of your trust — a good thing to remember in the equally strenuous days to come.

Now with Two Service Stars

THE L. S. STARRETT CO. · ATHOL · MASSACHUSETTS · U. S. A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

Simple Indexing of Any Angle—IV

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

N=Holes per Division. *D*=Appropriate Hole Circle

	0		1		2		3		4		5		6		7		8		9	
Turn	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.200	40	200																		
.201	40	199	38	189	34	169	32	159	29	144	26	129			24	119	22	109		
.202	20	99	39	193	37	183	35	173			16	79	33	163			29	143	14	69
.203	40	197			38	187	25	123	36	177	23	113	34	167	22	108	32	157	21	103
.204	41	201	30	147	39	191	19	93	37	181	9	44			35	171	17	83		
.205	41	200	24	117			31	151			15	73	37	180	36	175			7	34
.206	41	199	27	131	20	97	39	189					25	121	37	179			18	87
.207			35	169	40	193					33	159	38	183			16	77	21	101
.208			41	197			30	144					39	187			19	91	42	201
.209	37	177			32	153	27	129	40	191			35	167	13	62	30	143	38	181
.210	42	200	25	119	33	157					36	171							31	147
.211	42	199	38	180	34	161	15	71	37	175			40	189	29	137			32	151
.212			14	66			38	179	41	193			27	127			30	141		
.213	36	169	39	183	42	197					19	89	22	103	28	131	34	159	43	201
.214							6	28							41	191	32	149	26	121
.215	43	200	20	93	17	79	31	144			39	181	36	167	33	153	30	139		
.216			43	199	24	81			37	171	21	97	34	157	39	180	31	143	41	189
.217			38	175					35	161			42	193	32	147			39	179
.218	29	133					43	197	26	119	33	151	40	183	7	32			44	201
.219	30	137			41	187					27	123	38	173			20	91	42	191
.220	44	200	35	159	24	109	39	177			28	127					17	77	36	163
.221	40	181	44	199	25	113			29	131	33	149	37	167						
.222					42	189											43	193	39	175
.223	31	139	27	121			44	197			40	179	36	161			32	143	45	201
.224	41	183	43	58			24	107			33	147	42	187	20	89	38	169		
.225	45	200	43	191	34	151	25	111	39	173			30	133			14	62		
.226	40	177	45	199			31	137	36	159	41	181					22	97	27	119
.227	37	163					10	44			43	189	28	123	23	101	41	180		
.228	44	193	39	171	34	149	29	127	45	197			40	175			46	201	19	83
.229	41	179	33	144			36	157	25	109	42	183					37	161	43	187
.230	46	200	26	113	32	139			44	191							39	169		
.231			46	199	40	173	34	147	28	121	25	108	41	177			35	151	16	69
.232	42	181					23	99					30	129	37	159	44	189	17	73
.233	24	103	45	193			42	180			46	197	32	139			47	201	40	171
.234	33	141			26	111	41	175					42	179	23	98			35	149
.235	47	200					44	187					45	191	37	157	29	123		
.236	38	161	34	144	47	199							31	131	40	169	9	38	23	97
.237	41	173	23	97			42	177	33	139			43	181			34	143		
.238			45	189			46	193	36	151	26	109	47	197			48	201	43	180
.239	38	159	11	46			39	163	17	71	40	167			29	121	41	171		
.240	48	200			43	179	31	129	44	183	19	79	45	187	26	108			46	191
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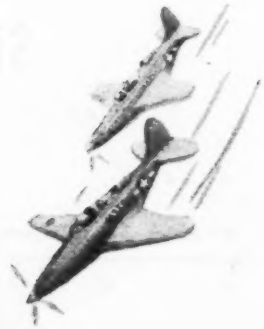
.242	38	157			39	161			16	66			41	169	25	103	42	173	43	177
.243	26	107	44	181	27	81			46	189	47	193	48	197	29	119	40	201	30	123
.244			31	127			32	131	44	180			34	139			35	143	36	147
.245	49	200					39	159	40	163	41	167	42	171	43	175	44	179	45	183
.246	46	187	47	191	49	199			17	69			18	73			19	77		
.247					22	89	23	93	24	97	25	101			27	109	28	113	30	121
.248			33	133	35	141	37	149	40	161	43	173	45	181	50	201				
.249																				

N=Holes per Division. *D*=Appropriate Hole Circle

	0		1		2		3		4		5		6		7		8		9	
Turn	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.250	50	200																		
.251					50	199	48	191	46	183	43	171	40	159	38	151	36	143	33	131
.252	32	127	30	119			27	107	26	103	25	99			23	91			22	87
.253	21	83			20	79					18	71			17	67	51	201	49	193
.254	48	189	46	181	45	177	44	173	43	169							41	161	40	157
.255	51	200	25	98			36	141			35	137	46	180					39	153
.256					31	121	51	199	30	117			49	191	48	187	47	183	33	129
.257	46	179	45	175			44	171	26	101	43	167	17	66	42	163			37	144
.258			16	62			39	151	23	89	38	147	15	58	52	201			41	159
.259	50	193			49	189	21	81			34	131			47	181	33	127	51	197
.260	52	200	45	173	32	123	44	169			31	119							46	177
.261			47	180			52	199	40	153					39	149	50	191	42	161
.262	49	187	27	103			48	183	37	141			47	179			36	137	11	42
.263					45	171					44	167	34	129	53	201	43	163	46	175
.264	52	197	14	53	51	193			23	87	32	121	50	189	9	34			38	144
.265	53	200	22	83	48	181	39	147			47	177			38	143	21	79	40	151
.266			29	109	37	139	53	199							48	180			46	173
.267	51	191	43	161	35	131	27	101	50	187	42	157	19	71	34	127	49	183		
.268	41	153			48	179	33	123			40	149	54	201			25	93	32	119
.269	53	197			7	26			52	193	45	167			24	89	51	189	44	163
.270	54	200	37	137			30	111	43	159					49	181	39	144		
.271	29	107			48	177	54	199			41	151	22	81	47	173	28	103		
.272			40	147	49	180	52	191							51	187				
.273					50	183	44	161	38	139	32	117	55	201	49	179			43	157
.274	20	73	54	197	17	62	48	175			42	153	53	193	25	91	36	131	47	171
.275	55	200	52	189	41	149			46	167	27	98	35	127					24	87
.276			45	163	50	181			55	199			39	141	44	159	49	177		
.277			23	83	28	101	33	119	48	173	53	191					50	180		
.278			52	187	37	133			27	97	22	79	56	201	51	183			41	147
.279			36	129	55	197	50	179			45	161	26	93	40	143	54	193		
.280	56	200					44	157	53	189			39	139	48	171			25	89
.281	43	153			9	32	9	32	56	199			29	103	20	71	51	181	42	149
.282			33	117	46	163			37	131	50	177	13	46	54	191	28	99		
.283	45	159			49	173	51	180	53	187	36	127	57	201	40	141			23	81
.284	48	169	52	183			56	197	31	109			35	123	41	144	43	151	51	179
.285	57	200													54	189				
.286									57	199			49	171	41	143	37	129		
.287	31	108	29	101			52	181	48	167			44	153	21	73	40	139	19	66
.288	55	191	51	177			47	163			58	201	43	149	28	97	54	187	52	180
.289	50	173			24	83	57	197			11	38	53	183	31	107	20	69	49	169
.290	58	200	56	193			18	62			52	179	34	117			41	141		
.291	55	189	23	79			37	127	58	199					42	144			47	161
.292	40	137	26	89					50	171	43	147			36	123	53	181	29	99
.293	46	157	17	58	56	191			49	167	59	201	32	109	42	143	52	177		
.294			55	187					58	197	48	163	38	129			51	173		
.295	59	200	54	183			57	193			13	44	47	159			50	169	29	98
.296			53	179			56	189			59	199			27	91				
.297	30	101	52	175			33	111			36	121			39	131			42	141
.298	45	151	48	161	51	171			57	191	60	201	43	144	23	77	26	87	26	87
.299			38	127	41	137	44	147	53	177	59	197								

(This table will be continued in an early issue)

JUST HOW IMPORTANT IS A HUB NUT?



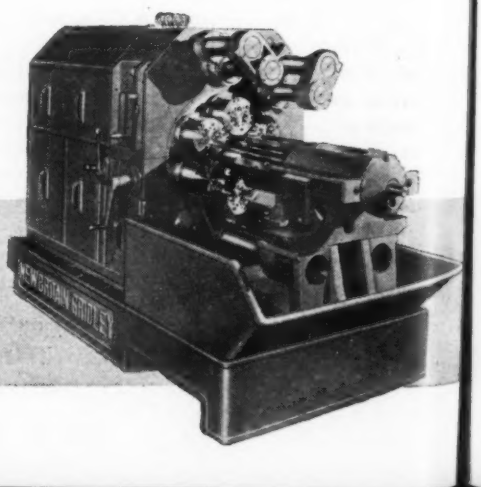
● *Airplane propeller hub nut, requires fifteen cuts to assure extreme accuracy and mirror smooth finish.*

At twenty thousand feet, with the prop turning up 1800 R. P. M. this hidden part is strictly a matter of life and death to the pilot. Naturally it's not one of the things he worries about . . . he doesn't *have to* . . . because the manufacturer of his new type hollow ribbed steel automatic propeller left nothing to chance.

Production of faultless unseen components like propeller hub nuts present real manufacturing problems. This world famous manufacturer wisely turned the job over to the Model 675 New Britain Chucker, fully equipped with the latest carbide tipped tools. Then the high sustained production of the part . . . demanding smooth finish and complex, accurate cuts . . . becomes a routine procedure.

It is a typical example of how American Industry is turning out new and better weapons of war that command the respect and admiration of the men who stake their lives on mechanical perfection.

New Britain automatics can furnish the right answer to production puzzles in your plant, now and postwar. Check your problems with the *New Britain* sales-engineer in your district today.



NEW BRITAIN

THE NEW BRITAIN MACHINE COMPANY • NEW BRITAIN, CONN.

NEW BRITAIN-GRIDLEY MACHINE DIVISION

M-01007

Gaging Business

Tool Shipments Leveled

The volume of machine tool business for 1945 is still uncertain, depending upon the course of the war. But one thing is clear: the tool industry will do well to be able to maintain shipments at current levels. With critical war plants given manpower referral priorities, tool builders see little chance in increasing their labor forces. Moreover, it will be quite an accomplishment to retain the present work force against inroads of the draft and normal turnover.

Aside from starting off this year with a backlog of $260,000,000, as compared with 1944 full-year shipments of $501,548,000, the industry seems to have experienced the bulk of its military order bulge from November through January. There is talk of sizable orders still in the offing, but these have not jelled yet. In any event, the industry will receive an over-all total of $120,000,000 in Russian tool orders for delivery through September 30, 1945. The majority of these orders have already been placed.

February Schedules Upset

War production during February is likely to experience several wide shifts upward and downward from item to item due to conflicting influences. On the bearish side is the bad weather, which has tied up fuel shipments, reduced steel production, and entirely halted operations at many war plants for several days. On the bullish side is the fact that workers in non-essential industries have been rushing to sign up for jobs in war plants due to impending work-or-fight legislation.

The national steel rate for the week beginning January 29th fell to 90.1 percent of capacity, and to 89.3 percent in the following week according to the American Iron & Steel Institute. This was the lowest point since January, 1942, except for the regular holiday dips in operations on the Fourth of July and Christmas. This production loss of some 200,000 tons of steel was due to heavy snows, resulting in rail tie-ups of iron ore, coal, and limestone. In turn, this will hit the entire channel of war production in plants that will be affected by this loss in steel production. In addition, lack of oil and gas has also interfered with February's war production record.

On an over-all basis, this means that many programs will experience bad lags in their February schedules, others will show surprising gains.

Munitions Goals High

The February disruptions will increase pressure upon industry to catch up with new production schedules set on the assumption that the war in Europe will last through 1946. Comparing second-quarter 1945 schedules with last October, 50 percent of war programs will be up, 35 percent will be down, and 15 percent remain unchanged. "Hot" aircraft programs, including the C-54, B-29, B-32, and Navy dive-bombers and fighters, will have to be stepped up 3 times from the October level of $300,000,000 to $900,000,000 monthly in the second quarter. In the same period, ammunition schedules show a 75 percent rise.

Army Steel Needs Up

Steel requirements for the Army will reach an all-time high in the second quarter, when the senior branch of the services is asking for 750,000 more tons than in the first quarter. If the Army gets the better part of what it is asking for, it means that many essential civilian programs will suffer.

Steel needs have been hiked for these programs; rockets and bombs, both heavy-heavy and light-heavy trucks, heavy ammunition and artillery, landing mats, aircraft tanks and drum stock. Indications are that lend-lease and other export steel demands will not be cut to satisfy increased military demands.

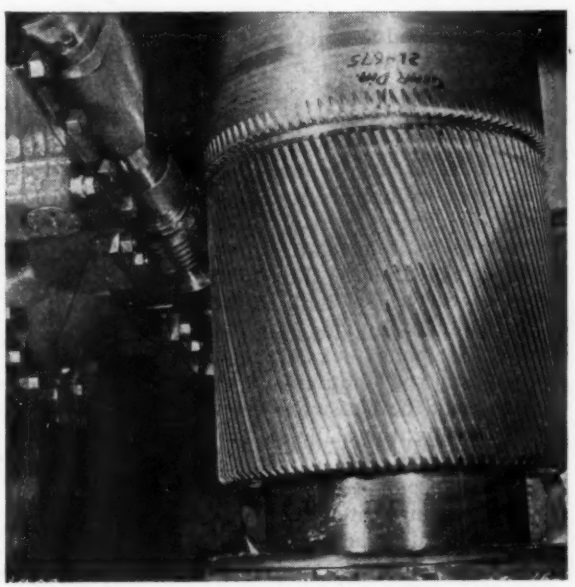
Some observers hold that this is all part of a plan to squeeze civilians. They believe that WPB Chairman Krug is powerless to stem the encroachment of the military, who are said to have decided to take up all materials to prevent industry from turning to new civilian goods output. This would prevent unemployment, and provide justification for greater controls than ever over industry and labor.

Thus, CMP may be continued after VE-Day because needs of the armed services and for allied nations may force its retention. Other manufacturing and manpower controls may also be retained.

Reconversion Well Deferred

Industry would not be surprised if war production programs will have to be further increased. The reasons are that military plans now point to intensification of the Jap war immediately after VE-Day, and the general belief that reconversion will not be allowed to go very far. Since much of the equipment in Europe will not be suitable for the Pacific war, there are reports that it will be left there after Germany falls. Some government officials insist that equipment in Europe may be rehabilitated for the Pacific war. In either event, it now appears that there will be little or no cut-backs on VE-Day.

Increased war schedules are not due to losses in the December German counter-offensive. Actual losses are reported to have been very small, since no American munitions dumps are said to have been captured. The increase is reported to be due to previous underestimates of usage of shells and ammunition, the simultaneous waging of two large-scale wars in Europe and the Pacific, and the advanced timetable for the Pacific warfare.



Carbide-tipped Hobs—Continuing its experiments in gear-hobbing under supervision of Navy's Bureau of Ships, Joshua Hendy Iron Works has now established that carbide-tipped hobs at surface speeds up to 300 feet per minute will cut gears with an 80 percent or more time saving on both roughing and light finishing cuts. Here a light finishing cut is being made at 174 rpm, 261 feet per minute surface speed

Ravaged France Requires Lend-Lease, Long-Term Credit Aid

Lend-lease may offer France some of the raw materials and equipment she badly needs. Machine tool requirements alone come to $40,000,000. Nation to get priority over other liberated areas. Credit terms being planned

WASHINGTON—The French government is now negotiating a lend-lease agreement for finished steel, copper, aluminum, machine tools, other industrial equipment, shoemaking and yarn spinning machinery, and most vital of all, transportation equipment ranging from ships and planes to locomotives, cars and rails. Such broad requirements stem from France's desperate necessity for taking specific action for rehabilitation and reconstruction. Moreover, it is reported that many idle French plants could be producing material for the Allies if raw materials and fuel were provided.

Approximately $40,000,000 worth of machine tools have been requested for early delivery under lend-lease. France will accept the 7000 or so tools involved in current wartime models. However, the tools she pays for to be used in reconstruction must be the latest post-war designs, according to reports.

Steel Needs Large

The Foreign Economic Administration has been asked to supply about 500,000 tons of finished steel products during the 1945 first half, and about 120,000 tons of this will be furnished during the first quarter. The Supreme Allied Expeditionary Forces will distribute an additional 100,000 tons of drum stock for making jerry cans and 55-gallon drums.

Already made public are transportation needs for 600 steam locomotives, 60,000 freight cars, and 200 merchant ships. These items are proving tough to find considering United States requirements and other lend-lease commitments. Aggravating the shipping situation is the fact that federal investigators have discovered that Liberty ships have been used as warehouses both on the West Coast and in England.

The Germans took 75 percent of French railroad equipment in their retreat, and half of what was left is now serving the Allies. To make matters worse, lack of coal is hampering transportation, which itself is further complicated by the coal shortage. This fuel situation is causing considerable human suffering, according to American observers who have just returned to the United States. But shipping is not available to supply French needs from the United States or Great Britain.

Tool Subsidiaries Welcome

Foreign Trade experts recently arrived from abroad suggest that France will welcome establishment of subsidiaries of American machine tool and steel companies to attain greater self-sufficiency and to absorb American techniques said to be some 20 years ahead of French practices.

For undisclosed reasons, French lend-lease and reconstruction demands are going to get priority over other liberated nations of Europe. As a result, billions of dollars of goods and credits will soon begin to flow from this country to France. Some government officials fear British competition.

France has $2,000,000,000 in frozen funds which the DeGaulle government is now trying to secure from the custody of the U. S. Alien Property Custodian. With these funds, France expects to stabilize her currency which is now greatly inflated.

British Relax Machine Tool Control; Reconversion, Export Plans Advanced

LONDON—Simultaneously with the announcement in London and Washington that Britain has purchased 58,000 American lend-lease tools, the Ministry of Supply issued an order that from February 1, comprehensive control of machine tools in Britain will be eliminated. This applies to 90 percent of British machine tools. Selective control will be applied to the remaining 10 percent still in demand for vital requirements. In addition, from February 1, new orders will not be subject to statutory price control.

This order no longer makes it necessary for a buyer of certain types of equipment to obtain an order from the Machine Tool Control. However, suppliers of these machines must advise the Machine Tool Control of acceptance and completion of orders. Furthermore, orders of exceptional importance will be dealt with by means of "Preferential Delivery Instructions." The production and allocation of scarce types of machine tools will still be controlled, by placing them on "Nominated List." Orders for any of these machines will be accepted by suppliers only under the authority of "Supply Certificates."

Britain has also abolished licenses for used machine tools. This will give prospective purchasers of such equipment greater freedom for buying Government surplus machines not held in reserve for possible war uses, and which are now in a pool administered by the Machine Tool Control. From February 1, sales from this pool will be on a new price basis, which has been set at a level favorable to buyers in order to facilitate re-equipping factories.

Aiding Reconversion

The cash purchase of all machine tools still held here on lend-lease terms, followed immediately by the relaxation of comprehensive control of machine tools and other metal-working equipment, is indicative of the Government's efforts in planning for reconversion at the earliest possible moment, and to make possible before the end of the war the production of goods for export trade. All machine tools obtained under lend-lease can now be used without question for the manufacture of goods in the latter category. This removes the main obstacle to commercial freedom for Britain after the recent lend-lease arrangements, whereby Britain since January 1 has been purchasing steel, aluminum and other materials required for the production of export goods.

Although British industry may not be able to take full advantage of these developments until the final defeat of Germany, plans for re-equipping factories can now proceed more or less unhampered. Industrial concerns can plan for themselves the purchase and sale of machine tools and metal-working equipment as needed. All this aims at production on a scale more efficient than that existing prior to 1939, and is compatible with Britain's announced intention of increasing post-war exports to levels unprecedented in peacetime. The Government will no doubt adopt every means to attain this objective. As a step in this direction, it is believed that the task of compiling a central register of machine tools and other metal-working equipment has been started.

Inside Detroit

More War Orders

It's just like the early war days in Detroit—new war orders pouring in, new construction going up, facilities being enlarged, pressure for more workers. Production is expected to build up to a new peak by early Fall.

In January alone, the services placed more than $604,000,000 in new contracts in the Detroit region. This was about one-fourth of the total for 1944. There is still pending another half billion which is being processed through the services and the Production Urgency Committee.

Small Plants Helped

The increased orders are bound to have a far-reaching effect. First of all, several hundred small plants which have been living a hand-to-mouth existence will feel an upsurge of new life. A week bfore the regional War Production Board here announced over a half billion in new work, the little fellows were rushing to the Smaller War Plants Corp. for help. Their prime contractors had been brushing them off with the remark "we're having a tough time keeping going ourselves." Sub-contracting seemed to be out of the window. Now it will come back.

The four steel mills here also felt the effects. They reported more orders in January than in any other one month since the war began. Their business last month was equal to one-fourth of all their 1944 orders. It was a good reflection of the increasing demands for production.

Women Needed Again

With the draft making great inroads again in the labor supply, an attempt will probably be made to get women back into the plants. About 60,000 are reported to have left their jobs and not returned. Many are still in the labor market and represent something like 95 per cent of the compensation claims from the state. The others, because of home conditions, are not anxious to return. Most of them have been laid off the first shift and will not take any other. Another drive to get them to help out at this critical time will probably be in order.

B-24 Contract Renewed

The new business sent to Detroit includes everything from high-explosive rockets to a renewal of the B-24 contract at Willow Run, which was to run out in June. The latter was the biggest single item running nearly $300,000,000.

It will be a new type of *Liberator* that will be coming out of the Ford bomber plant. It will also be a more useful one and its ultimate use will probably be in the final assault on the Japanese empire. When it is finally outfitted, the Japs will have a hard time differentiating between the *Liberators* and the B-29's.

Sizable Engine Order

The new contracts also include a sizable item for the more powerful Pratt & Whitney engines for which the Rouge has been tooled up. These engines will find their way into the latest super-bomber, to give it more power, range and maneuverability.

The largest order is still not placed. It will be for an entirely new weapon and will, like the B-29 work in its early stages, find its way into most of the shops in the area.

$50,000,000 Expansion

The additional war work does not include $50,000,000 earmarked for new plants and expansion of existing facilities. The enlarged tank program will benefit most by this. Both Chrysler Tank Arsenal and Cadillac will be expanded to keep up with the demand for the new types of tanks and Ford will enlarge its tank engine facilities to power them.

Chrysler will spend $15,000,000; Cadillac $12,000,000 and Ford $4,-700,000. Chrysler produced about 1,000 tanks a month at peak production. The new goal may be deduced from this.

More Tools Wanted

The press of new business has started inevitably the hunt for machine tools. With the tool builders about 5½ months behind on orders, the services are seeking as many as possible that they can get at once.

This resulted in a situation which left a general a trifle red-faced. After bellowing about the failure of one of the government agencies to produce what he wanted right away, he was told to glance over the list of surplus tools right in his own office. The list revealed that about one-fourth of the machine tools he was chasing about the country were on the lists reported to him declared surplus on his own records.

Rocket Shell Production Line—This department of the Dodge Main Plant in Detroit is in volume production of nose sections for rockets used by the U. S. Army Air Forces. Up to January 1st, Chrysler Corporation had turned out nearly 150,000 rockets in its Dodge and Highland Park Plants. Many of the machines shown here were formerly used in car and truck production

N. Y. Engineering Group Confers On Problems of War Production

NEW YORK—Power of the human mind in war and peace was the subject of an address by Reginald E. Gillmor, president, Sperry Gyroscope Co., at the fourth Conference on War Production at the Hotel Commodore, January 30. The conference was sponsored by 15 engineering societies, under chairmanship of Herold C. R. Carlson, to intensify efforts to speed war production.

Mr. Gilmor pointed out that the Germans and the Japanese had used ideas for destructive purposes both in propaganda and technical research. He said that with victory we will still have the problem of national survival and that it is up to us to apply our minds to the task of keeping the nation strong.

Lt. Col. J. R. Naylor, assistant chief of operations, War Production Board, named a dozen critical war materials and showed that trends in their production was upward. Colonel Naylor, a veteran of both the European and Pacific theatres of war, was recently ordered to return to this country to take active charge of the critical materials branch of WPB. Speakers were introduced by Sidney D. Kirkpatrick, editor, *Chemical & Metallurgical Engineering*.

Nine Technical Panels

Technical sessions at the conference consisted of a series of nine panels.

Of particular interest to the metalworking field were two panels on metals. The first of these was addressed by F. D. Foote, president, Alloys Development Co., who reviewed the nature and properties of low-alloy high-strength steels. Because of their higher tensile strength and yield point these metals can be used in small sections to produce light-weight designs, according to this speaker.

Stainless steel was the topic of Russell Franks, metallurgist, Union Carbide and Carbon Research Laboratories. Mr. Franks limited his discussion to the mechanical properties of austenitic stainless steels and showed how they could be improved by cold rolling or by no temperature heat-treatment. T. L. Fritzlen, metallurgist, Reynolds Research, gave a paper on aluminum and magnesium alloys pointing out both war and postwar applications. He gave attention to the use of aluminum alloys as high tension conductors in place of copper.

Foundry Value Outlined

Despite the fact that the foundry has sometimes been treated as a stepchild in war production, Donald J. Reese, Manufacture and Foundry Products Section, WPB, told of the value of gray iron as an engineering material. He deplored the fact that engineers frequently regarded it as unpredictable and applied factors of safety as high as ten when using it.

The second session on metals dealt specifically with transportation. Ernest E. Thum, editor, *Metal Progress*, broadly covered the subject of railway, automotive and aviation industries. Machine transportation was the subject of Paul Field, Department of Development and Research, Bethlehem Steel Company, Welding as applied to transportation facilities was described by Leon C. Bibber, welding engineer, Carnegie-Illinois Steel Corp.

A panel on applications of electronics was addressed by Arthur H. Moore, General Electric Co., who discussed phototube devices, motor control, and the electrostatic heating of dielectric materials. Principles of induction heating were explained by T. P. Kinn, supervisor, Industrial Electronic Equipment, Westinghouse Electric & Mfg. Co.

Small Shop Problems

"Who Can Help the Small Shops?" was the topic of a panel designed for the benefit of the small manufacturer. Colonel George S. Brady, the Douglas T. Sterling Co., spoke of the use of scale models in planning satisfactory plant layout.

In the same panel, the subject of equipment in the small shop was presented by A. M. Tullo, manufacturing engineer, Worthington Pump & Machinery Corp. Mr. Tullo told of the diversified problems of job shops and small production plants and their effect in the selection of machine tools.

Still another panel was devoted to safety. W. George Hill, safety director, Bakelite Corp., stated that the safety engineer should assist the medical director to match men to job requirements. A five-point program for safety was offered by T. R. Leadbeater, Ford Instrument Co., who also advocated designing safe machines, tooling and controls for the handicapped worker. New hazards caused by the use of unfamiliar materials in industry was discussed by Dr. Leonard Greenburg, executive director, New York State Department of Labor.

R. E. Gillmor, Pres., Sperry Gyroscope Co., Inc.

NTDMA TOLD OF GROWING WAR NEEDS AND DRAFT CALLS

HARTFORD—The accelerated demands of Selective Service and war production were stressed by military officials at the January 19th War Conference of New England tool and die shop owners, held by the National Tool and Die Manufacturers Association. Lt. Comm. J. F. Robinson, Connecticut Selective Service Director, warned industry to expect further inroads into their labor, because "we are now at the bottom of the barrel and we face increased quotas from the Armed Forces."

Brig. Gen. A. G. Gillespie, Commanding Officer of Watervliet Arsenal, cited battlefront figures of two-and-a-half tons of metal thrown against the Germans every minute since D-Day and 8,000,000 projectiles every month. He said, "Needs are increasing and it is becoming more difficult to determine what is sufficient. We need tanks, guns, ammunition, trucks and tires and we need them in torrents."

NTDMA President Richard F. Moore, of the Moore Specialty Company, Inc., discussed trade association activity in increasing war production and planning for the peace. George S. Eaton, Executive Secretary of NTDMA, urged tool and die shop owners to file occupational deferments for all skilled men up to 38 years of age.

Jamaicans Arrive to Ease Cleveland Manpower Shortage

CLEVELAND—The first contingent of 150 straw-hatted Jamaicans arrived in Cleveland in a blizzard last week, under 90-day contracts to work in foundries, railroad yards and fertilizer factories. The War Manpower Commission is bringing 400 to the area under an arrangement whereby if domestic labor is found for any of the jobs they hold, the Jamaicans will surrender them, and the government will assume the rest of their contract.

Wartime Washington

Service Act Support

The increased support in Washington circles for National Service legislation is largely the result of military efforts to justify such legislation. Congress went along part way in its modified law to provide authorities with a convenient stick, if persuasion fails. What worries the services is the possibility of a wholesale exodus from war industries right after VE-Day, unless the government has a law that can be used if necessary to control workers' movements. Such an exodus might handicap greatly the large programs projected for the Japanese war.

However, since December 1st, there has been a steady drift of men back into war jobs for the first time in over a year, employment having shown a gain of 50,000 during December alone. Admittedly, some of the improvement was stimulated by the "work-or-fight" decree of OWM Director Byrnes, but the setback on the western front brought people to the sober realization that the war was far from over. As for absenteeism, it is no worse here than in Britain, which has a stiff law against it.

Draftees and Veterans

Men from 26 to 30 will soon be subject to call, although those in critical and essential industries will be protected as much as possible. These men will be needed as replacements. When the German war ends, 4,500,000 troops in the European theater will be available for transfer to the Pacific, but only some of them will be required. A large number will be discharged.

A top manpower authority in Washington is cautioning industrialists not to expect too much from returning veterans right away. They also are urged to be patient with the men. The man who has been absent in the service a long time finds it hard to settle down for awhile. That is particularly true of troops who have seen combat duty.

Military Runs Show

There is no doubt on one point in Washington these days. So far as war production is concerned, the Army and Navy are in the saddle. The WPB is inclined to give the military what it wants with few questions asked. The country's war economy is being run behind the scenes by military authorities, and WPB officials are going along with them. Some higher-ups did a poor job of guessing the end of the European war, setting the date at October 30. They don't want to get caught again. They don't want the country to be swept again by a wave of super-optimism and have thousands of workers leave war jobs.

The idea now is to drive home to the people the fact that the war is not yet won and to discourage any kind of civilian manufacture unless it is vital to the war effort. Some war officials believe that rules and regulations resulting in sacrifices by civilians are desirable, whether or not the sacrifices are necessary. Entirely aside from such intentions, however, authorities don't want to get caught again cutting back programs and then finding that they have made mistakes. They would much rather err, and rightly, on the side of producing too much. Hence our new and enlarged war production program is based on the thought that the war will continue indefinitely.

Post-war Budget Worries

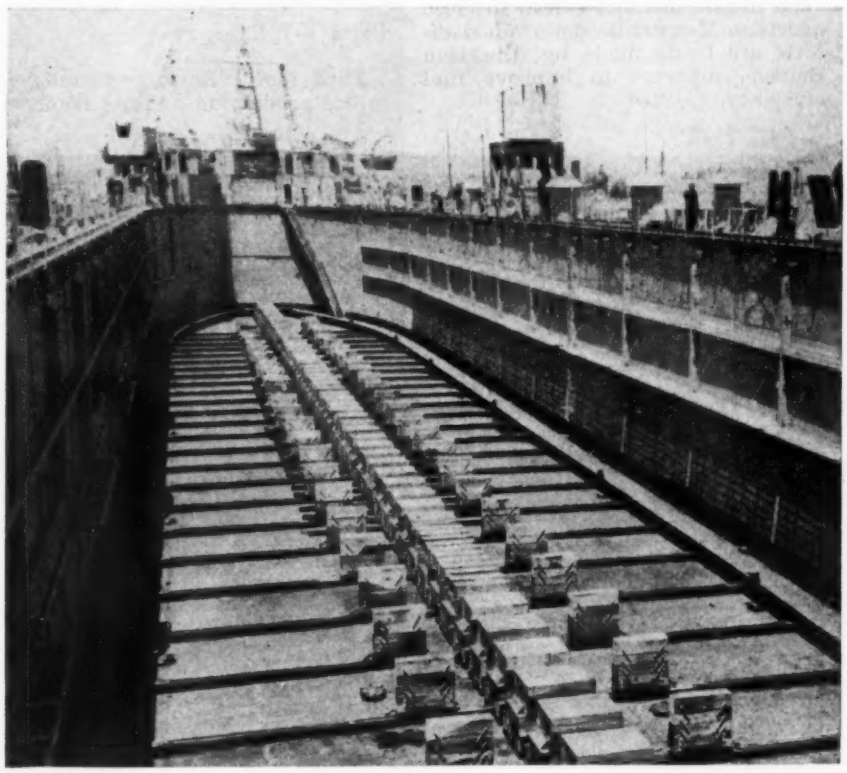
Some pessimistic, but realistic, thinking about the government's post-war budgets and financing is being done inside Congress.

A budget as high as $42,000,000,000 is foreseen for 1946-47, made up of $16,000,000,000 to $20,000,000,000 of non-war expenditures and $20,000,000,000 to $22,000,000,000 of so-called war expenses (for an enlarged Army and Navy and veterans' benefits). These figures include nothing for debt retirement. The opinion is that there is no chance of balancing the budget on a national income of less than $140,000,000,000 a year.

The belief is expressed that the government will be compelled to eliminate the excess profits tax as soon as possible after the war.

British Tool Deal

Leo T. Crowley, Foreign Economic Administrator announced that 58,000 American lend-lease machine tools had been sold to the British for $31,000,000, 19 percent of the original $166,000,000 cost. However, this cost was not adjusted for shipments lost enroute and for tools of little post-war value to the British, although it excluded handling and shipment costs. Sale price was based upon adjustments between American and British prices for similar tools, less depreciation. Of the 459,000 tools installed by the British in their war industries, 73 percent were British made, 14½ percent were American tools bought for cash, and only 12½ percent were lend-lease tools.



A Floating Dry Dock—An interior view of one of the Navy's floating repair bases, so constructed that it can scoop up a crippled destroyer, pump itself dry, and rise to cradle the damaged ship for repairs. The craft have proven cheaper and more practical than land-based drydocks. While they resemble an ordinary vessel from the side, they have no self-propulsion

Spotting the Air News

Jet Plane Priority

War production officials, off the record, indicate that jet-propelled fighter planes may be near top priority on the "hot" aircraft list near the close of the Japanese war. At present the jet plane's only major advantage is speed. But speed will be essential in opposing Japan's new fighters, which are approaching our own in most characteristics of effectiveness.

Fighter production in Germany has been and still is steadily increasing. This was done by dispersing production in barns, odd buildings, and underground structures, which could not be found and destroyed. Thus the Allies' hope of taking the Luftwaffe out of their air was frustrated. The Japs can, and undoubtedly are, doing the same thing.

Jet power development is too late for the war in Germany, but it is perfectly timed, if by accident, for conflict in the Pacific. Fuel consumption is so high, and the range so short, that jet fighters cannot be used on a large scale against the Japs till the conflict comes to close quarters. Meanwhile determined efforts are being made by American British engineers to improve fuel efficiency.

Postwar Jet Prospects

A checkup by the editors of this department indicate still no prospects of application of jet-turbine engines to civilian aviation. The experts shake their heads and say it is too fast and too inefficient. But the same experts would have lifted their eyebrows at any suggestion, early in this war, that the heat engine would play a major role in the war's closing scenes.

Some helicopter engineers now say publicly that jets mounted on trailing edges of rotor blades, expelling combustion gasses or compressed air, offer the ideal power for rotary winged flight. Reverse torque, which tends to turn the fuselage opposite from rotor direction, is now counteracted by bi-axial twin rotors, by co-axial twin rotors, and by anti-torque propellers on the tail of the helicopter. Jet drive would eliminate torque. Thrust efficiency of jet power in helicopters would be easier to attain than in airplanes, because the periferal speed of the rotor is high and fairly constant. Fuel economy would remain difficult.

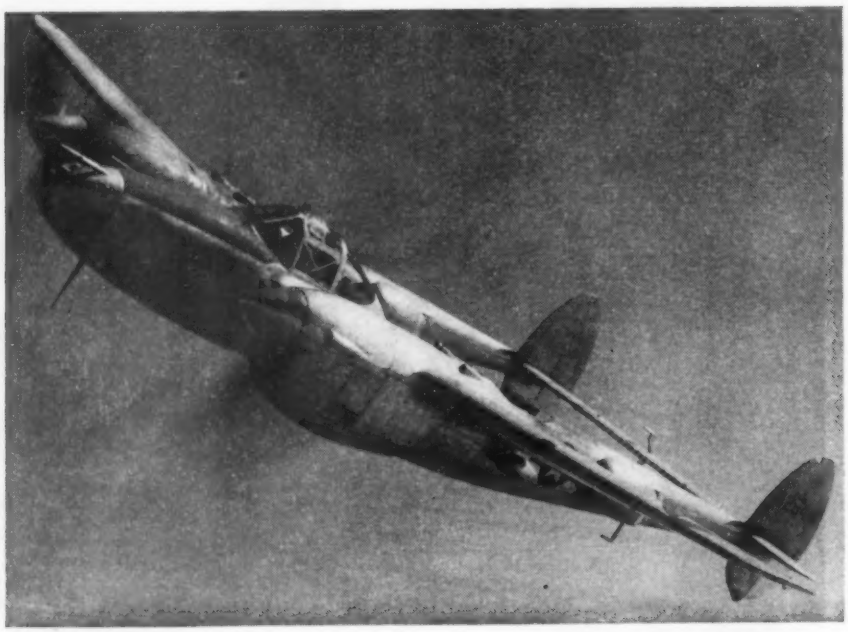
Ford V-1 Engines

Ford Motor Company announces initial production of buzz bomb engines for Army Air Forces. Ford's model is an improvement on the German V-1. Army soon will release detailed information, because obviously the enemy knows all about it. Essentially the buzz engine is a tube. Air is forced in the front end by forward motion— about 400 m.p.h. This air passes through a grille of more than 200 little reed valves—like the reeds of a harmonica. The air is mixed with gasoline, low octane from several fuel nozzles. Pressure is built up slightly by vent restriction. A spark plug explodes it, back pressure closes the reed valves, and the expanded gasses rush out the thrust nozzle rearward. The cycle rate is about 42 per second.

After the engine starts ignition is spontaneous from the heat of the tube. The unit must be moving forward nearly 150 m.p.h. to give it enough air for self sustained flight. Therefore, it must be launched by catapult or other means. Fuel feed is increased in proportion with speed by a mechanism activated by a pilot tube, or air speed meter. A barometer effects fuel feed changes for altitude. An idler fuel control permits the engine to be started before the bomb is launched. The power of all jets is measured in pounds of thrust, not in horsepower. Thrust of the Ford engine is about 600 pounds at top speed.

Impulse Engine Simplest

This is the "impulse" type engine, characterized by a series of power thrusts. It appears to be the simplest of all internal combustion power plants. Its fuel efficiency is extremely low, because its compression ratio is low. The jet-turbine type of engine, used on jet planes, which delivers a continuous flow of thrust, is more efficient because its turbine gives a higher compression ratio. Still higher efficiency of the conventional reciprocal type is due mainly to its very high compression ratio, which in modern aircraft engine designs is as much as six to one.



New Model P-38—The 18th model of the P-38 Lightning is equipped with a new supercharger device giving it added power, and has revolutionary air compressibility flaps and hydraulic aileron booster control. The twin-engine fighter-bomber carries a bomb load of 4,000 pounds, and will fly over 425 miles an hour. Maximum flying range with drop tanks is over 3,000 miles

SAE Elects New Officers, Hears Gladman on Standards

DETROIT—Election of J. M. Crawford, chief engineer, Chevrolet Div., General Motors Corp., as president for 1945 of the Society of Automotive Engineers, was announced during the organization's annual meeting. Activities headed by new vice-presidents are: Aircraft—J. L. Atwood, executive vice-president, North American Aviation, Inc.; Aircraft Engine—R. W. Young, chief engineer, Wright Aeronautical Corp.; Diesel Engine—W. A. Parrish, executive engineer, Superior Eng. Div., National Supply Co.; Passenger-Car —A. G. Herreshoff, chief research

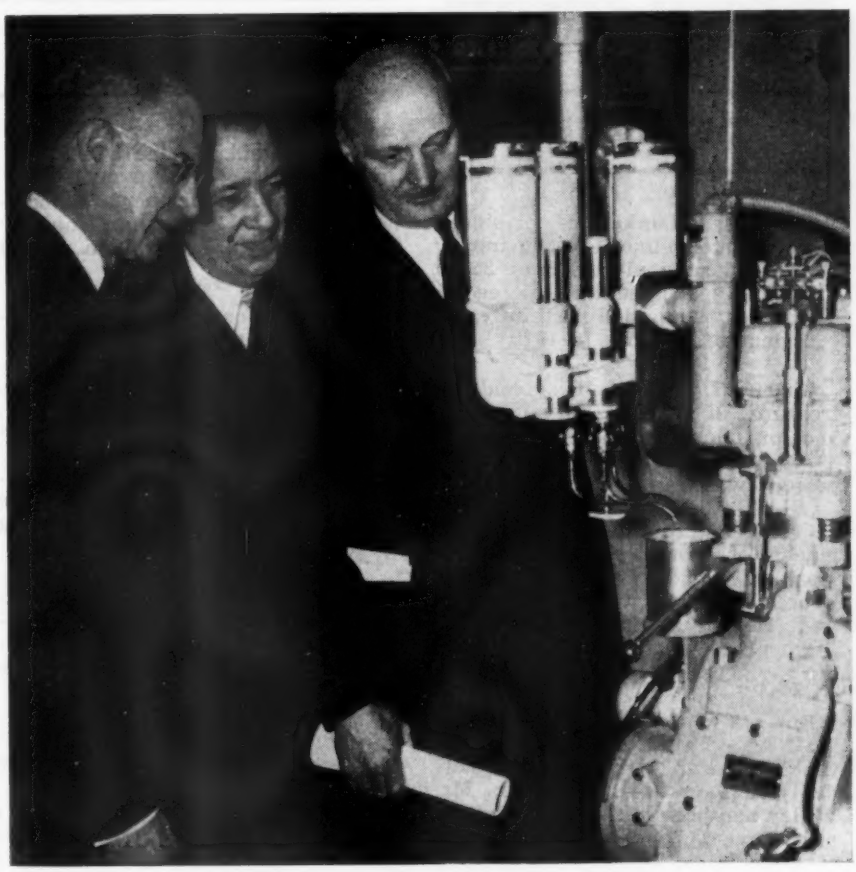
engineer, Chrysler Corp.; Production—L. V. Cram, Detroit Diesel Engine Div., General Motors Corp.; Tractor and Farm Machinery—W. F. Strehlow, chief engineer, Tractor Div., Allis-Chalmers Mfg. Co., and Truck and Bus—H. A. Flogaus, engineering vice-president, J. G. Brill Co. B. B. Bachman, engineering vice-president, The Autocar Co., was re-elected treasurer.

The 1944 Daniel Guggenheim Medal for achievement in design was awarded to Lawrence D. Bell, president of the Bell Aircraft Co.

International Drafting Standards

Considerable interest was aroused at the meeting by a proposal that drafting room practice in relation to interchangeable components be made the subject of an "international" code subscribed to at least by the British Empire and the United States. C. A. Gladman, scientific officer, National Physical Laboratory, England, discussed the subject broadly and offered a system of notations on drawings. His American audience was not immediately "sold" on the idea. Some objected to any move that would further complicate drawings; others were less critical, remembering the difficulties that have been encountered during the war effort when companies endeavor to interpret the drawings of other American companies, the military organizations, and especially foreign drawings so far as manufacturing needs are involved.

Applications of induction heat-treatment to internal surfaces of automotive products such as cylinder sleeves and liners, hubs, bearing cages, gears, splines and also to industrial hydraulic cylinders were described by Howard E. Somes, chief engineer, Budd Induction Heating.



James M. Crawford (left), newly elected president of the Society of Automotive Engineers, and chief engineer of Chevrolet; SAE general manager John A. C. Warner, and SAE past-president William S. James, chief engineer of Studebaker, examine a fuels research engine made by Waukesha Motor

Names in the News

Herbert L. Markham, former vice president, has been elected president of the Parker Appliance Co., Cleveland, Ohio, to succeed the late Arthur L. Parker.

John Lucas, formerly vice president and assistant general manager of The Yoder Co., Cleveland, Ohio, has been elected president and general manager of the company, succeeding the late **Carl Yoder,** one of the original founders of the firm. Mr. Lucas joined the Yoder Co. in 1935 as general sales manager, having previously been with the Lewis Foundry and Machine Co., Pittsburgh. Pa.

John Lucas

H. H. Brooksieker

Herman H. Brooksieker has been appointed vice president in charge of manufacturing of the Kaydon Engineering Corp., Muskegon, Mich. For the past seven years, Mr. Brooksieker has been vice president and superintendent of the Pesco Products Div., Borg-Warner Corp., Cleveland, Ohio.

Clifford T. Appleton, for the past eight months manager of the Rolled Thread Die Company's machine division, has been named sales manager to succeed **E. S. Walker,** who has resigned to establish a New England sales agency handling all the company's products.

A. O. Thalacker, who has been with the Detrex Corp., Detroit, Mich., since 1937, has been elected vice president and general manager of the firm.

George C. Lea has joined the Ohio Nut & Bolt Co., Berea, Ohio, as vice president, succeeding the late **Homer J. Wilkinson.**

William L. Wilson has been elected vice president of Kellett Aircraft Corp. Formerly in charge of the company's public relations, Mr. Wilson has served as assistant to the president of the company since November 1943.

R. S. Hudgins has been appointed plant superintendent of Kennametal, Inc., Latrobe, Pa., succeeding **W. E. Newcomer,** resigned.

W. W. Gleeson has been appointed vice president and general manager of L.G.S. Spring Clutch Corp., Indi-

W. W. Gleeson

L. G. Goetz

anapolis, Ind., wholly owned subsidiary of Curtiss-Wright Corp. Mr. Gleeson, former general production manager of the propeller division at Caldwell, N. J., will be succeeded by **Frederick W. Moore,** recently supervisor of materials control at its Beaver, Pa., plant. At the same time, **Joseph R. Eggert** was named plant manager of the organization's plants at Caldwell and Clifton, N. J., and **George L. Lang,** plant manager of the division's propeller plant in Indianapolis, Ind.

Louis G. Goetz has been appointed vice president in charge of central operations of The Trundle Engineering Co., Cleveland, Ohio. Mr. Goetz who joined the Trundle organization in 1936, will have over-all supervision of its service activities in Ohio, Mich., and adjacent territory in Ind., Ky., Pa. and western N. Y.

Clinton R. Hanna, associated with Westinghouse Electric and Mfg. Co. since 1922, has been appointed an associate director of the Westinghouse Research Laboratories.

Joseph Plasencia has been appointed export sales manager of the Fostoria Pressed Steel Corp., Fostoria, Ohio and will be responsible for sales in South and Central Americas, Mexico, Europe, Australia, India, New Zealand, parts of Asia, Puerto Rico, Cuba, Virgin Islands, Iceland and Greenland.

Charles L. Davidson has been appointed assistant general manager of Thompson Aircraft Products, Inc., Cleveland, Ohio. Mr. Davidson joined Thompson in 1926 and for the past two years he has served on the executive staff.

Charles S. Mattoon has been appointed industrial relations director of the Weatherhead Co., Cleveland, Ohio. Mr. Mattoon has directed industrial relations at the Curtiss-Wright Corp. plant in Buffalo, N. Y., for the past 18 years.

R. E. Fritsch, vice president of Tube Turns, Louisville, Ky., since 1929, has been elected president to succeed the late **Walter H. Girdler, Sr.** Mr. Fritsch, who joined Mr. Girdler when Tube Turns was originally organized, will continue as vice president and a member of the board of directors of the Girdler Corp, of which Tube Turns is an effiliate.

Frank W. Smith, Milton P. Higgins and **Ralph M. Johnson** have been appointed vice presidents of Norton Co., Worcester, Mass. Mr. Smith, former sales manager of the grinding machine division, was also appointed manager of that division succeeding **Howard W. Dunbar,** vice president, who continues in an executive capacity. Mr. Higgins continues as treasurer and Mr. Johnson as general sales manager of the abrasive division.

R. E. Fritsch

F. W. Smith

OBITUARIES

Ebhelby F. Lunken, 54, president of the Lunkenheimer Co., Cincinnati, Ohio, died suddenly January 25 at his home. Mr. Lunken succeeded his father, who died last July, as president of the firm in 1919.

Charles L. Bryant, 67, president-treasurer of the C. L. Bryant Corp. and president of the Bryant Machine Products Co., Cleveland, Ohio, passed away January 29.

Fred W. Grant, merchandising engineer of Norton Co., Worcester, Mass., died suddenly January 25 at Worcester. Mr. Grant had been with Norton for 32 years and last August was appointed merchandising engineer.

Roy C. Willey, abrasive engineer for Norton Co., Worcester, Mass., in the Pittsburgh territory, died suddenly January 16 in Pittsburgh. Mr. Willey had been with Norton for the past 23 years.

Ronald B. McKenzie, 46, president of the Acme Die and Machine Co., Latrobe, Pa., passed away January 23. Mr. McKenzie was also the founder of the Keystone Heating Co.

BUSINESS ITEMS

The Goodyear Tire & Rubber Co., Akron, Ohio, has opened a new district sales office in Charlotte, N. C., for its mechanical goods division. The Charlotte office will be headed by **R. G. Abbott,** transferred from Richmond, Va.

Westinghouse Electric & Mfg. Co. will relinquish the management of the U. S. Naval Ordnance Plant at Center Line, Mich., as of June 30, 1945. Subsequent to that date the management and operation of the plant will be directed by the United States Navy Department.

Lempco Products, Inc., of Bedford, Conn., has executed a contract in Washington with the **Defense Plant Corp.** to provide plant facilities for the firm at Byesville, Ohio.

Simson-Maxwell, Ltd., Vancouver, B. C., has been appointed British Columbia representative of **The Cooper-Bessemer Corp.,** Mt. Vernon, Ohio.

MEETINGS

CANCELLED MEETINGS

American Foundrymen's Association, 1945 War Production Foundry Congress. Detroit, Michigan. April 30-May 4.

American Gear Manufacturers Association. Annual Meeting. May.

American Iron & Steel Institute. General Meeting. New York, N. Y. May.

American Society for Testing Materials. Pittsburgh, Pa. Committee Week. February 26-March 2. Spring Meeting. February 28.

American Society of Tool Engineers. Industrial Production Planning Exposition and technical sessions. Cleveland Auditorium, Cleveland, Ohio. March.

National Metal Trades Association. Annual Convention. New York, N. Y. February 26-28.

Packaging Institute, Inc. Semi-Annual dinner meeting. New York, N. Y. April 18.

Society for the Advancement of Management. Spring Conference. Drake Hotel, Chicago, Ill. March.

Shop Equipment News

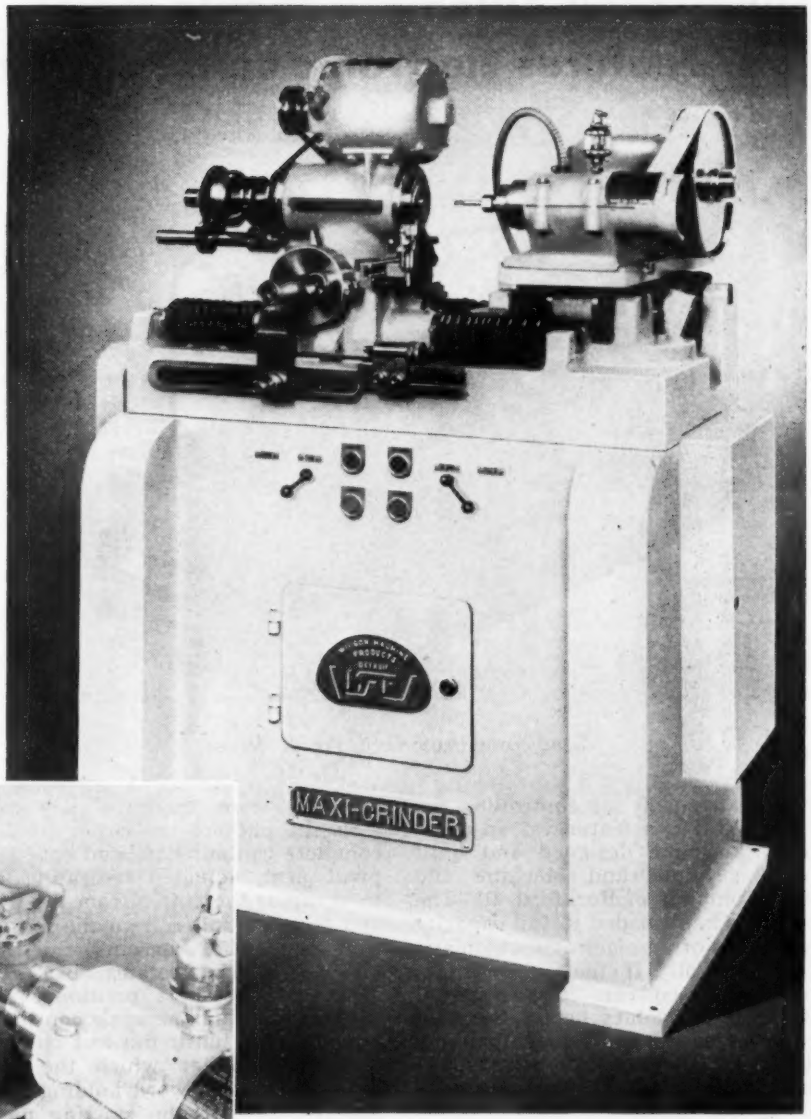
Maxi-Grinder With Built-In Sine Bar For Taper Set-ups by Wilson Machine

The collet-chucking internal grinding machine manufactured by Wilson Machine Products, 1231 Beaufait Avenue, Detroit 7, Mich., provides for tapered and angular hole grinding set-ups by means of a built-in sine bar. This feature is said to insure a high degree of accuracy and a low time loss for set-up.

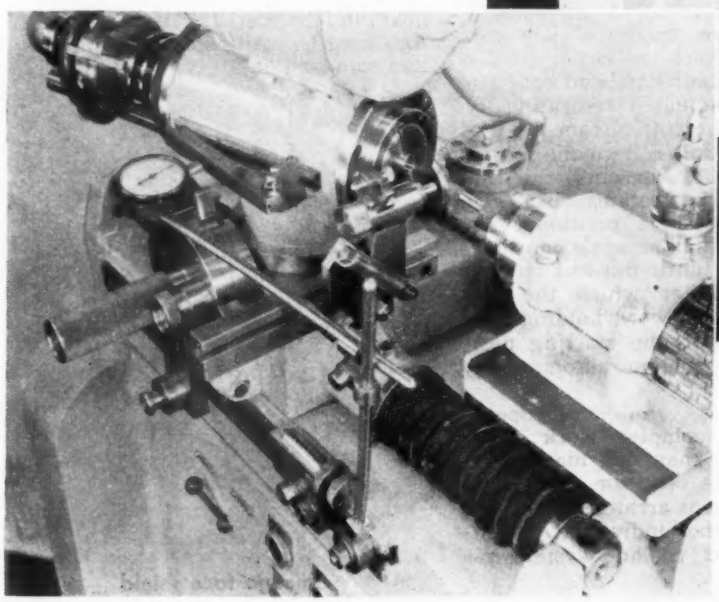
The operating controls of the machine have been positioned to permit the operator to perform all controlling motions with the left hand. This arrangement frees the operator's right hand for loading and unloading the workhead exclusively.

The collet is opened and closed automatically by a cam and lever arrangement with the workhead slide movement. This arrangement maintains the collet in closed position at all positions of the workhead except at the extreme end of the workhead slide return movement.

The oscillating movement of the grinding spindle is made through a motor-driven mechanical differential



Maxi-grinder with built-in sine bar



Built-in sine bar and individually powered mechanical movements are controlled by left hand of operator

unit driving the ram in which the grinding spindle is mounted. This unit has been specifically engineered to eliminate the possibility of grinding bell-mouthed holes. The length of stroke is adjustable to adapt to conditions of shoulder and blind holes, and ram speed is adjustable in six steps.

The diamond wheel-dresser is equipped with a micrometer feed adjustment.

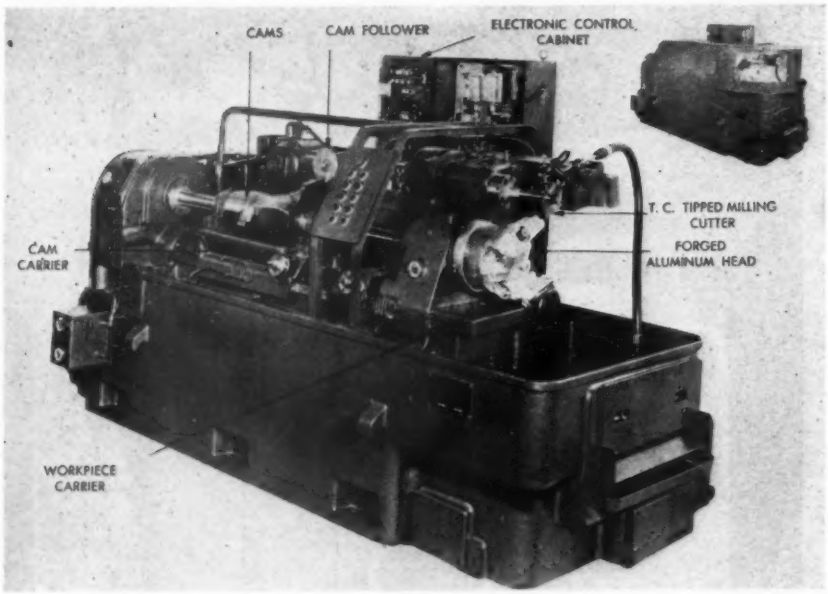
To decrease heating and wheel glazing, a dust collector draws grinding dust through the spindle and away from the working area.

The grinding spindle is powered by a ½ hp.-3450 r.p.m. motor. Spindles with speed ranges from 12,000 to 65,000 r.p.m. may be furnished as specified.

The workhead spindle, grinding-spindle ram and the workhead power traverse are each powered by individual ¼ hp. motors, all for 220/440 v. 60c. operation.

Maximum collet capacity is 1⅝ in., step collet capacity 3½ in. Maximum traverse of workhead is 8½ in.

Sundstrand Automatic Profile Miller Features Electronic Cutter Control



Sundstrand Automatic Profile Miller

An arrangement for controlling the cutter load is a feature of an automatic machine designed and built by the Sundstrand Machine and Tool Company of Rockford, Ill. The cutter is kept loaded to full capacity by means of an electronic automatic feed control. If the cut becomes light the feed rate increases, and if the cut becomes heavy the feed rate decreases; depending upon the depth of cut and horsepower consumed it can vary from 6 in. to 60 in. per minute.

The machine's work cycle is completely automatic. The operator presses the control button and the pivot arm, carrying both cutter and cam roller, rapidly traverses to within ⅛ in. of the start of the cut. The shaft carrying the master cams and work part then starts to rotate. The pivot arm feeds the cutter into the part until the cam roller contacts the cam, then the cam controls the path of the cutter until a complete contour has been cut. The pivot arm, actuated hydraulically, then rapids the cutter from the part and the cam roller from the master cam—the shaft carrying the cam and work part rotates back (in rapid) to the start position. The cutting and indexing cycle continues automatically until the last cut has been made, after which the cam carrier slide and work holding slide indexes back to the starting position and the machine automatically stops.

The completely automatic operation through complex work cycles permits more than one machine to be run by one operator.

The machine is arranged to permit the use of either individual or centrally located coolant systems as desired.

Tool Craft Ground Stock, Die Blocks and Plates Announced

A line of ground tool steel, ready-cut die blocks, punch plates and stripper plates, available from Tool Craft Co., 1835 Westchester Ave., New York 60, N. Y., is intended to help tool and die makers standardize and simplify their operations.

Ground stock is made of high-grade carbon water hardening steel and of non-shrink oil hardening steel. It is available in standard 18 in. lengths ranging in thickness from ⅛ to 1 in. with a variety of sizes.

The ready-cut die blocks, made from the same types of steel, finish ground + 0.005 to + 0.010 for thickness, have two faces and two sides parallel and the ends are squared. Sizes range from 3 × 4 × ½ in. to 10 × 14 × 1 in., with 18 in. lengths also available in any of the standard widths and thicknesses.

The punch and stripper plates are of cold rolled or machine steel ground — 0.005 to — 0.015 in. in numerous dimensions and in sizes to match the die blocks. The sizes range from 3 × 4 × ¼ in. to 10 × 14 × ⅝ in., with 18 in. lengths also available. Sides are parallel and ends squared.

Chicago Face Shield Has Quickly Changeable Visor

A face shield produced by Chicago Eye Shield Co., 230 Warren Blvd., Chicago 12, Ill., features quickly changeable face visors and snug fit against the chest to prevent entrance of flying particles from below. The form-fitting headgear rests easily on the head, while soft leather sweatbands give added comfort.

The new shield is available with open top headgear, half crown headgear and helmet-like top and bottom guards. Adjustable headbands and standard on all types.

Chicago face shield

Lodge & Shipley Lathes *at work*

producing parts of every type and size for Carlton Radial Drills

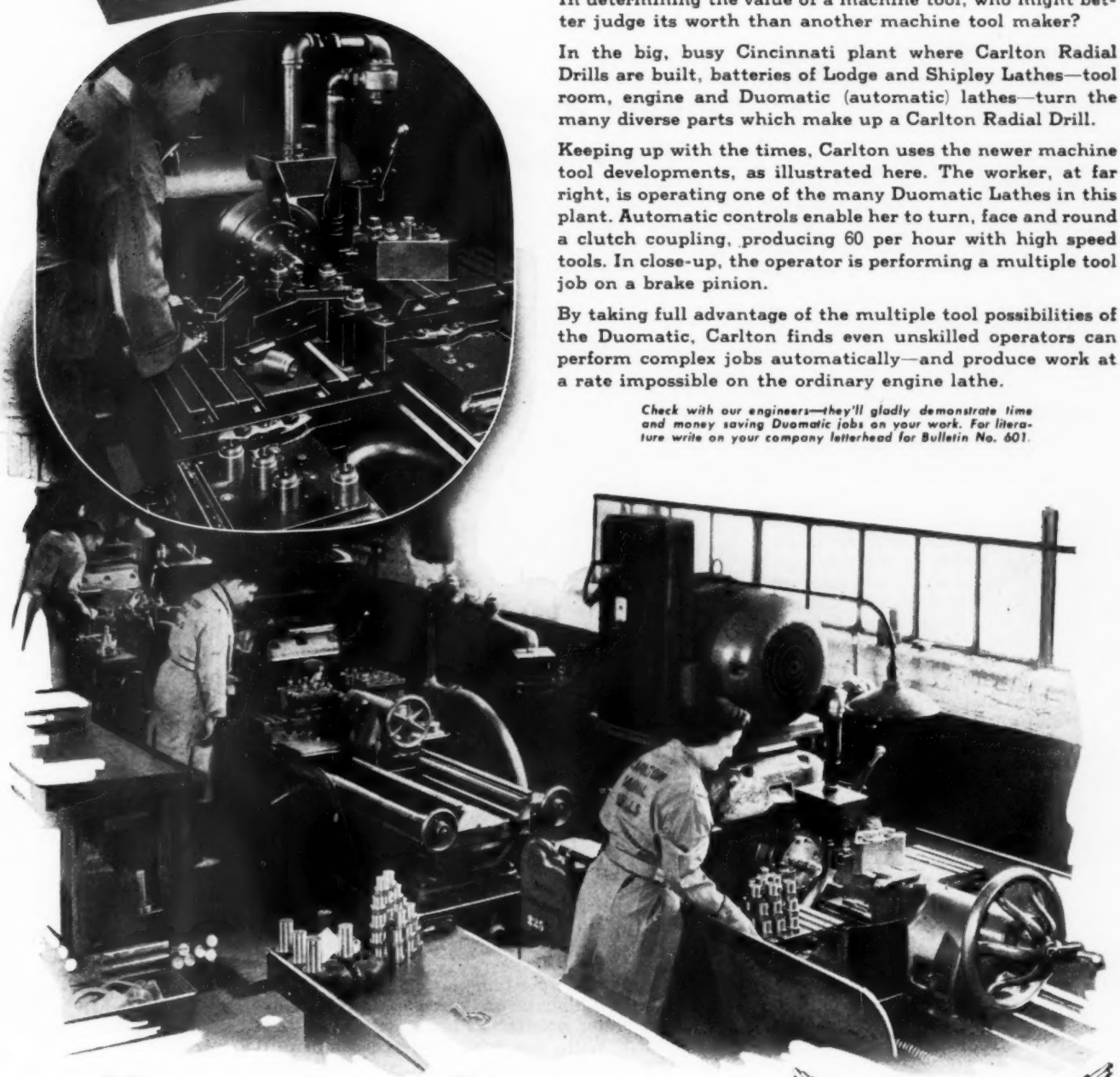
In determining the value of a machine tool, who might better judge its worth than another machine tool maker?

In the big, busy Cincinnati plant where Carlton Radial Drills are built, batteries of Lodge and Shipley Lathes—tool room, engine and Duomatic (automatic) lathes—turn the many diverse parts which make up a Carlton Radial Drill.

Keeping up with the times, Carlton uses the newer machine tool developments, as illustrated here. The worker, at far right, is operating one of the many Duomatic Lathes in this plant. Automatic controls enable her to turn, face and round a clutch coupling, producing 60 per hour with high speed tools. In close-up, the operator is performing a multiple tool job on a brake pinion.

By taking full advantage of the multiple tool possibilities of the Duomatic, Carlton finds even unskilled operators can perform complex jobs automatically—and produce work at a rate impossible on the ordinary engine lathe.

Check with our engineers—they'll gladly demonstrate time and money saving Duomatic jobs on your work. For literature write on your company letterhead for Bulletin No. 601.



THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

Carboloy Adds Smaller Sizes In Steel-Roughing Tool Bits

Shock-resistant tools of 78C Carboloy cemented carbide in sizes from ⅜ to ¼ in. have been added to the list of Carboloy stock sizes. They are available in right- or left-hand straight turning, right or left 15 deg. turning and square-nose types from the Carboloy Company, Detroit 32, Michigan.

Micronoil Moldeze Lubricates Molds for Plastic and Rubber

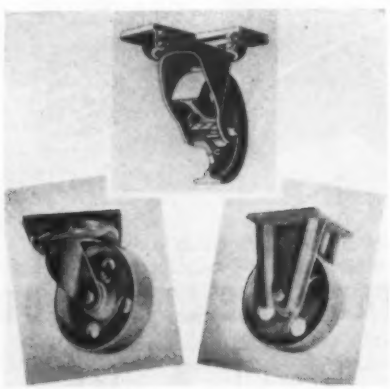
Micronoil Moldeze is described as a lubricant treatment for plastic and rubber forming molds. It is said to give a high anti-adhesion quality when brushed or sprayed into a heated mold, and to impart a smooth finish to the molded part.

It does not cloud or watermark clear plastic and does not build up a coating in the mold, according to the manufacturer, Protective Coatings Incorporated, Detroit 27.

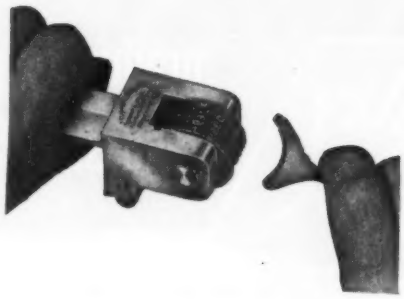
Market Forge Matched Casters Take Loads to One Ton Each

A line of matched casters for loads up to one ton each, is being produced by Market Forge Co., Everett 49, Mass. The large diameter ball bearing swivel serves as both a thrust and radial bearing. The upper and lower ball races are of the same diameter. The lower balls carry no load reaction as the center of the load wheel lies within the ball circle. The under balls carry the entire static load and every ball carries its share at all times. They run in machined race ways.

The design is such that the caster is protected from intrusion of foreign material. All types of wheels are available. The casters are made of stainless steel, monel metal or plain steel. They are made in 4, 5, 6, 7, 8 and 10 in. dia. sizes.



Market Forge matched casters

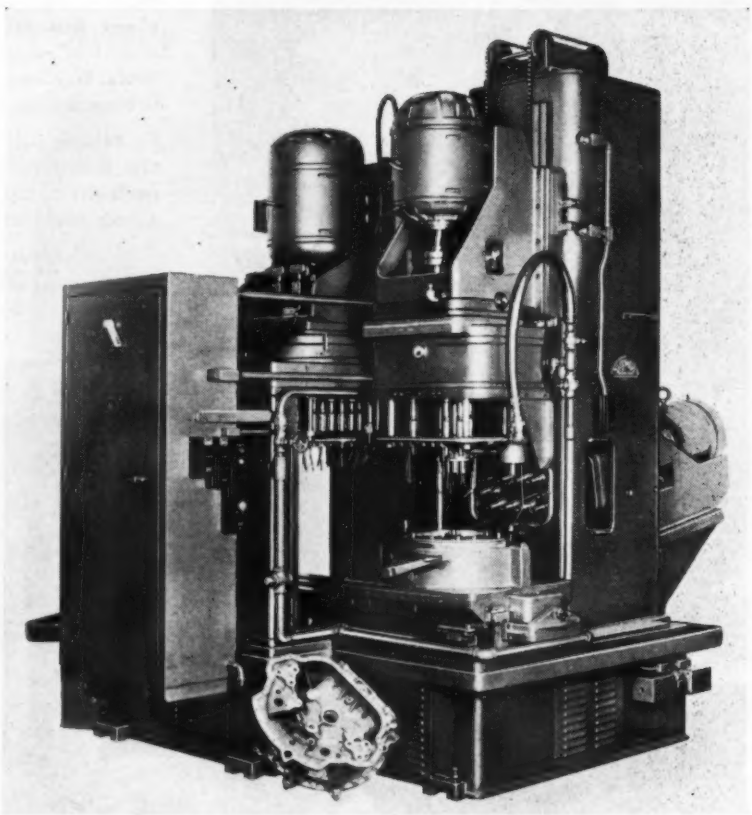


Numberall spanner wrench

Numberall Wrench Speeds Numbering Machine Setting

Numberall Stamp & Tool Co., Hugenot Park, Staten Island, New York, announces a wrench designed for quicker turning of their non-automatic Model 70 number machine. The wrench is recessed on its periphery and fits into space between wheels, guiding the wrench alongside the wheel. There hook on the wrench catches onto the character of the wheel, without slipping off.

Snyder Multiple-Tapping Machine Provides for High-Speed Operation



Snyder multiple-tapping machine

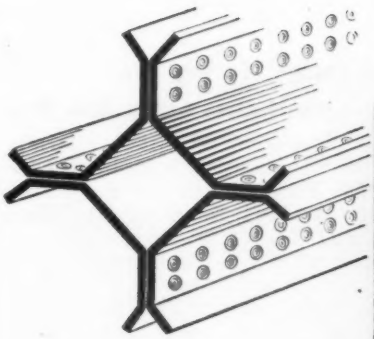
The Snyder multiple-tapping machine is semi-automatic and has special features for production tapping operations. With the part loaded and clamped, the vertical head is moved to position hydraulically and both vertical and angular heads tap a series of holes.

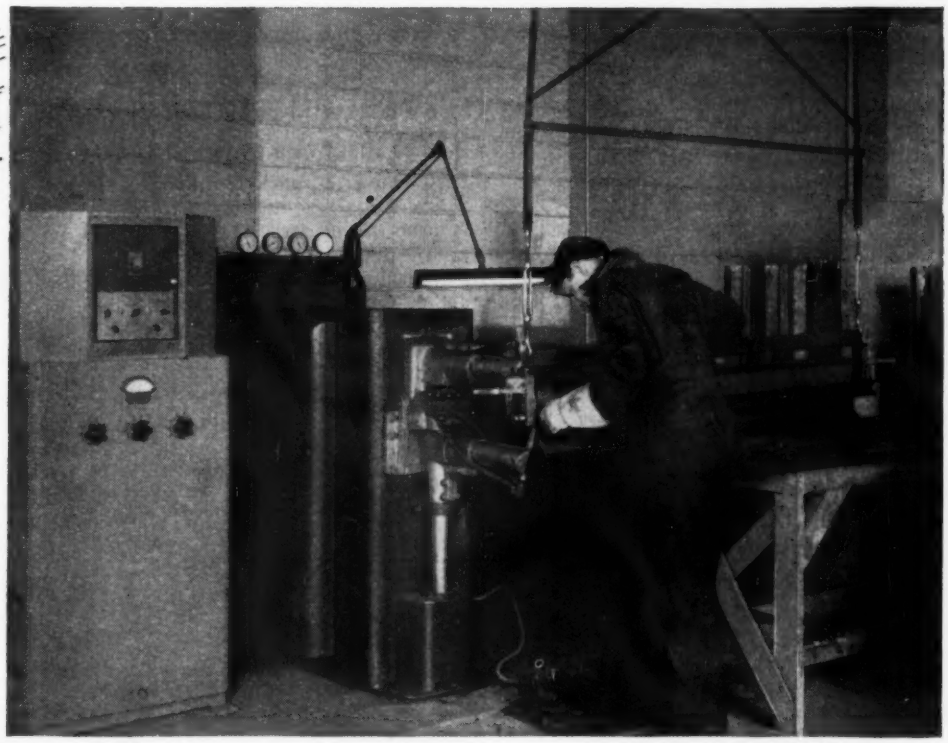
The vertical head then returns to rear position and the part automatically moves to the second working position, at which point the vertical and horizontal heads go through in the tapping cycle. When the taps have retracted, the part is finished and automatically returns to the loading station where the fixtures are cleared of finished parts and reloaded with untapped parts to complete the work cycle.

All leadscrew tapping spindles are equipped with safety spindle ends and floating tap holders. The safety spindle end goes into action when the hole is shallow or small, when the tap is dulled or the tap hole has not been drilled. This eliminates tap breaks and thread failures.

The machine was designed and built by the Snyder Tool & Engineering Company, 3400 East Lafayette, Detroit 7.

Quarter-inch-steel welds on 26.7 KVA (maximum demand)





Right: PROGRESSIVE Battery Welder, with mono-rail quick-clamp fixture, making 1/4 inch thick welds in structural steel at the rate of 29,000 every 20 hours, on a maximum input of 26.7 KVA.

and 29,000 Spots per day

The job was to produce fluted structural parts for an ordnance job of 1/8 inch thick steel stampings. Specifications called for 240 welds per unit—1/4 inch total thickness.

It would have taken 150 KVA A-C demand to do this job, but that much power was not readily available.

The answer was a PROGRESSIVE BATTERY WELDER. (Shown above). That welder with only 12 battery cells has been running 20 hours per day, turning out 6 assemblies per hour. The batteries are kept charged by a charger operating from a 220 volt line. Maximum recorded draw of this charger is 70 amps. per phase—a peak of 26.7 KVA—an amount of power that can be handled by ordinary shop wiring, eliminating bus bars, etc.

In addition, the BATTERY WELDER is producing a better job. Control is easier, induction losses are reduced.

For the story of "How and Why of Battery Welding", write for booklet #902.

PROGRESSIVE WELDER CO.

SEAM PROJECTION & BUTT • *Electric Welding Equipment* • PORTABLE GUN & PEDESTAL

3050 E. OUTER DRIVE • DETROIT 12, U. S. A.

Picker 50 kv. Industrial X-ray Unit Is Shock- and Ray-proof

The 50 kv. industrial X-ray unit, No. 6021, produced by Picker X-ray Corporation, 300 Fourth Ave., New York, N. Y., is shockproof, rayproof and rated for continuous operation over long periods. The tube has a grounded water-cooled anode and utilizes a 1 mm. square projected focal point with a 20 deg. target. The X-ray beam emerges through a beryllium window which gives the lowest degree of inherent filtration.

The high-voltage transformer for this unit is single pole and incorporates a water cooling coil to improve performance under continuous operation.

The control unit incorporates an

Picker 50 kv. industrial X-ray unit

auto-transformer with 20 steps of control from 5 to 50 kv. output by a 10-step minor selector and a 2-step major, which is part of the combination main switch.

Focal film distance is adjustable from 6 to 12 in. The field coverage at 6 in. is 4.36 in. dia. and at 12 in. is 8.73 in. dia.

Mirac Single-Coat Enamel Directly Applied to Steel

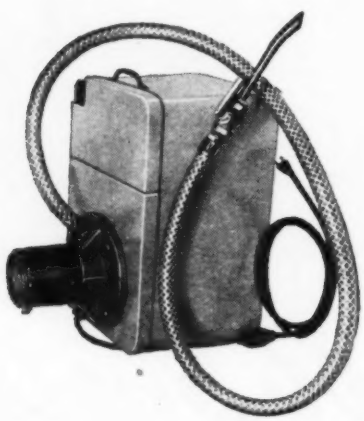
Mirac single-coat porcelain enamel for direct application to steel, is available from Pemco Corp., 5601 Eastern Ave., Baltimore 24, Md. Mirac is described as having characteristics of high-quality white cover coat and adhesion of good ground count, as well as high opacity, brilliant luster and good resistance to physical and thermal shock. The coating is fired at 1,500 F. and requires no special handling.

Cleco Pneumatic Baby Saw

Cleco Pneumatic Baby Saw Rips Metal Sheet and Leaves no Burrs

The Cleco Pneumatic Baby Saw, for ripping metal sheet to 3/16 in. thick, is announced by The Cleveland Pneumatic Tool Co., 3781 East 77 Street, Cleveland 5, Ohio.

The Cleco is described as capable of cutting 1/16 in. steel at the rate of 1 in. per sec., on a straight or curved line, leaving edges free from burrs. It weighs 2¾ lb., is about 8 in. long and turns up 2,000 r.p.m.



Brady portable tank coolant pump

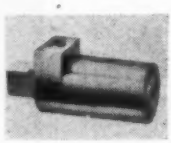
Brady Announces Pinch-Hitter Pump to Handle Coolants

Brady Pump Co., Muncie, Indiana, has added a portable tank coolant pump to its Pinch-Hitter line. The Pinch-Hitter portable tank coolant pump may be carried by hand to any machine requiring use of coolants, the tank filled with coolant and operation started merely by plugging the electric cord into an ordinary light socket. Capacity of the pump is 300 g.p.h. for water and solubles and 250 g.p.h. for light oils. Flow of coolant from the nozzle is manually controlled by the operator from one drop to total capacity. Four multiple nozzles may be used.

The baffled, split-lidded tank of 16-gage welded steel is 16 in. long, 9 in. high and 10 in. wide and may be cleaned without disturbing the return in piping. The induction, ball bearing, totally enclosed 110 v., one phase motor is drip-proof and dirt-proof and is externally fan-cooled by a heavily guarded cooling fan on the shaft extension. The extra heavy, one-piece shaft is attached to an open impeller.

Nash-Zempel Boring Bar Insert Uses Scrap Tool Bits

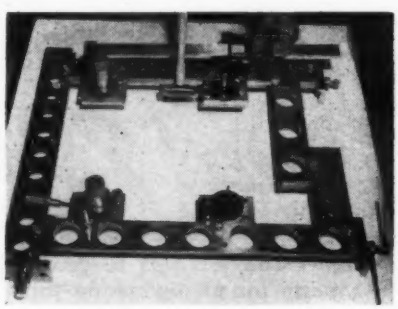
The micrometer-adjustable boring bar insert manufactured by Nash-Zempel Tool Division of the J. M. Nash Co., 2354 North 30 St., Milwaukee, Wis., uses short pieces of scrap tool bits as replacement cutters. It is but necessary to square the cutter stock on a surface grinder, to fit the insert.



Boring bar insert

Thereafter, a boring operation is all that is required to install the insert on any bar. The locating head of the boring bar is said to fit snugly into the recessed slot of the bar itself and always assume the same location.

The micrometer dial of the insert has 25 graduations of one-thousandth of an inch each. Forty standard sizes of boring bar inserts are available and special ones can be had.

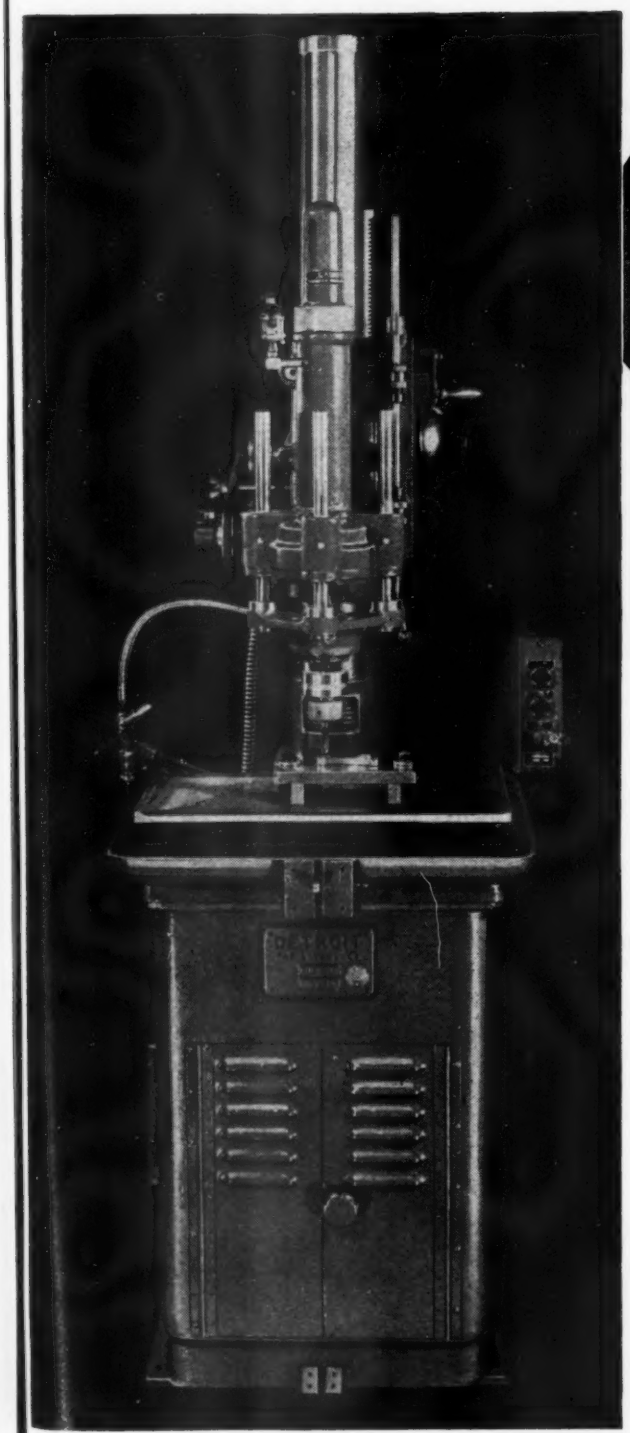


Micro-King Borlocator

Borlocator Makes Possible Quick Jig and Fixture Assembly

The Micro-King Borlocator, a development of Steel Tools, Inc., 2307 Prospect Ave., Cleveland 16, Ohio, consists of a set of 150 precision components, including master location plates, that can be assembled to conform to any layout by means of special locking clamps and screws. Combinations of drill jig bushings, drill bushing adapters and lock screws are mounted on the location

180% Increase in production
25% Increase in tap life
Fewer rejects



With *unskilled women* operators replacing trained men, Flint Manufacturer's Machine Service Co. obtained the above results by using DETROIT lead-screw type tapping machines instead of conventional equipment.

The job involved was tapping a 7/16—20 NS thread 3/8 in. deep to a class 3 fit in a 50 cal. machine gun part made of tough 1050 steel.

Equipment consisted of a Detroit Light Duty LTM-16 machine equipped with simple locating pins on the work table and floating tap holder.

Production obtained per machine was 450 pieces per hour equivalent to an overall average, floor to floor, of 8 seconds per piece. High accuracy obtained is credited to an unique LEAD SCREW drive.

We will be glad to furnish you with a bulletin covering the Detroit LTM line of tapping machines. Ask for Bulletin LTM-44.

DETROIT

TAP & TOOL CO.

8432 BUTLER AVENUE . . . DETROIT 11, U. S. A.

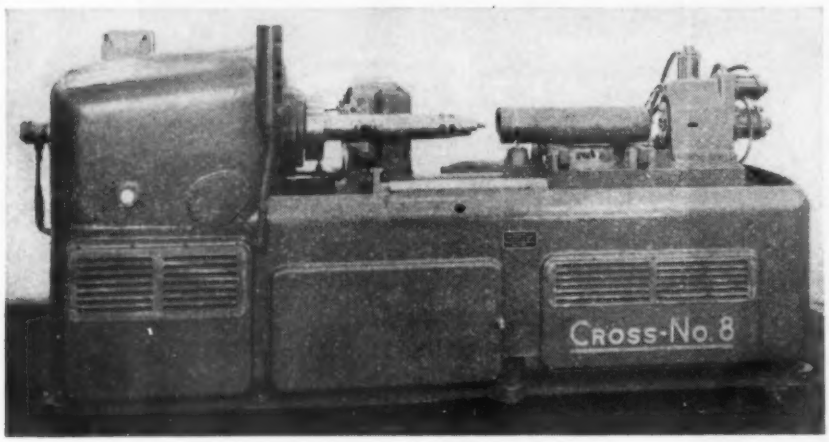
plate according to the specified center distances of the holes to be drilled.

Locating pins are inserted in the drill bushings before the final locking up of the assembling of location plates and bushings. With a vernier caliper set for hole center-to-center distance, plus one-half the diameter of the respective locating pins, measurements are made over the pins of any pair of bushings and a light tapping of one bushing plate permits locating to the final thousandths or less.

The location plates are chrome plated and are precision made. They may be assembled end to end, side by side or end to side. To insure accuracy and rigidity, the interlocking grooves of the plates incorporate a half-wedge in their cross-section so that when two plates are mated a full wedge is formed. As a result, the contacting areas of any two locked plates are under compression.

Holes in the location plates are at uniformly fixed and accurate center positions and the holes accommodate the drill bushing adapters by means of which a greater variety of combinations of bushing outside diameters and wall thicknesses can be accommodated at each hole position.

Cross Company Machine Centers and Cuts Shell Forgings Automatically



Cross automatic centering and cutoff machine

The No. 8 Cross automatic machine, manufactured by The Cross Co., Detroit, Mich., is built to handle shell forgings from 4 to 7 in. dia.

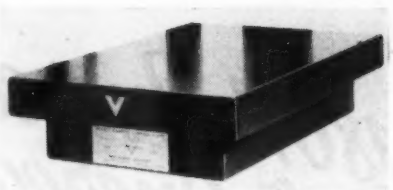
Lifting of the work is eliminated and the shell forging is automatically loaded on the arbor, which then expands to grip the work in cutting position. The loading rails in the carriage are automatically lowered to clear the work while it rotates and the cutting tools feed to depth. After the cutting operation is completed and in automatic sequence, the tools are retracted, the work stops, the chuck jaws are released, the carriage loading rails are elevated and the pick-up lathe removes the shell forging as the carriage is returned by power to the loading position.

Control of the fully automatic work cycle is from a centralized push button station. The worm driven headstock spindle is mounted on tapered roller bearings and a positive forced feed lubrication system supplies fresh oil to all moving parts. The electric control circuit is interlocked for safety and to prevent cutting tool breakage.

Whiting Heavy-Duty Fork Lift Truck Has Tilting Mast

A diesel-hydraulic fork lift truck manufactured by Whiting Corporation, Harvey, Illinois, has a 6,000 lb. capacity hydraulic tilting mechanism which permits forward and backward tilting of the lifting mast.

Whiting Heavy-duty fork lift truck



Velsey granite surface plate

Velsey Granite Surface Plates Resist Wear and Deterioration

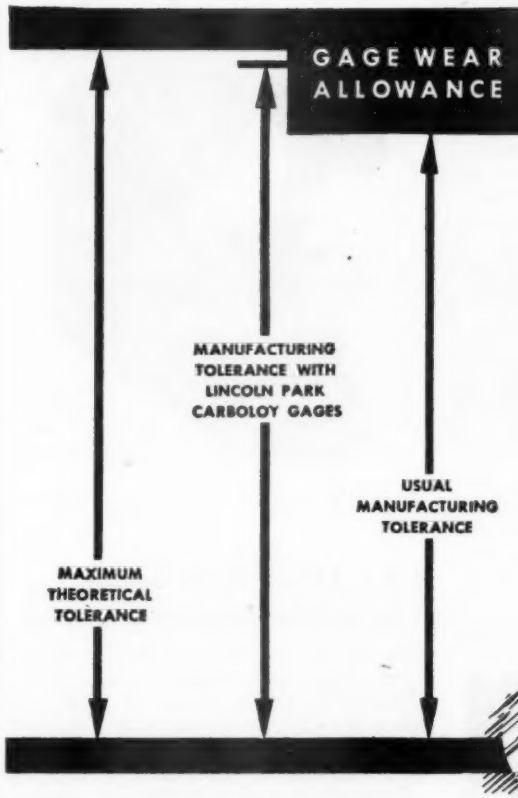
Velsey Surface Plates, distributed by the State Manufacturing & Construction Co., Franklin, Ohio, are of black diamond granite, lapped in a series of tolerances of 0.00005 in. surface flatness. According to the manufacturer, this flatness is never changed by shock or temperature fluctuation, while the material is harder than tool steel and cannot be scratched by instruments. Even if the surface were nicked by a heavy blow, the adjacent material would not be upset.

Everlasting qualities are claimed in that the surface plate will not oxidize, abrade or warp. Regular sizes available are 12 × 18, 18 × 24 and 24 × 36 in., though larger special sizes can be fabricated on order.

Behr-Manning Durabond Boosts Lifetime of Coated Abrasives

Behr-Manning, Troy, N. Y., announces Durabond treatment for hardening the adhesive of coated abrasives and making it more resistant to heat and less sensitive to humidity.

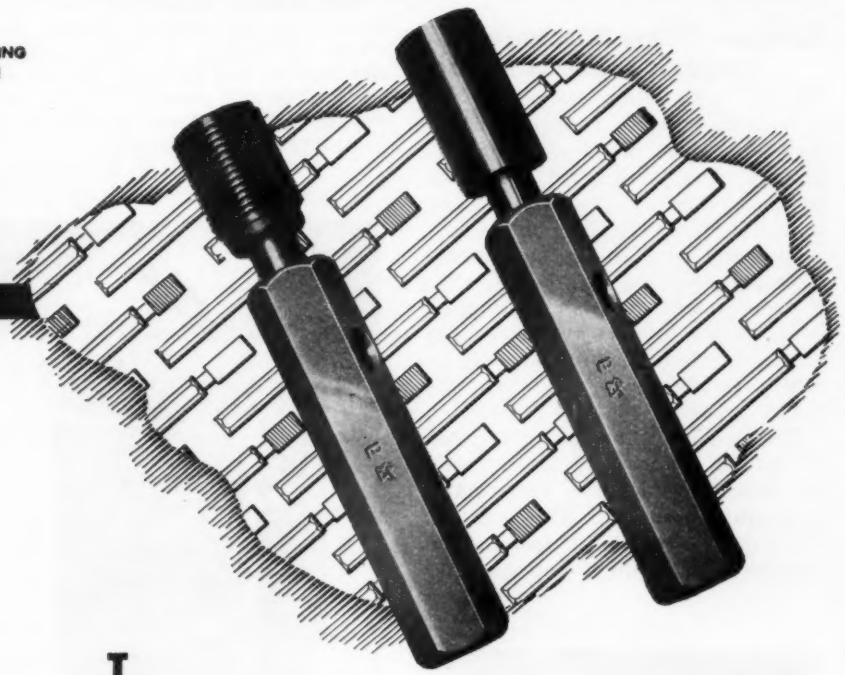
According to the manufacturer's description, Durabonded products have shown an average of 20 percent longer life on fast-running belts, fibre combination discs and the many cloth gadgets which are standard tools in this field.


GAGE WEAR ALLOWANCE
MANUFACTURING TOLERANCE WITH LINCOLN PARK CARBOLOY GAGES
USUAL MANUFACTURING TOLERANCE
MAXIMUM THEORETICAL TOLERANCE

DOUBLE ECONOMY

BY THE USE OF

LINCOLN PARK CARBOLOY GAGES



• At Least 50 Times the Useful Inspection Life of Ordinary Steel Gages.

• Unvarying Accuracy in Inspection of Parts Produced Extremely Close to Required Limits

In the many plants where Lincoln Park Carboloy gages are being used for the inspection of parts produced in mass volume, records invariably show savings of thousands of dollars in gage costs alone. This is the result of greater wear-resistance and longer gage life which, in some cases, has exceeded 200 times that of steel gages.

In addition, even greater savings—which cannot be actually recorded—are made possible because Lincoln Park Carboloy gages can be specified extremely close to required limits. With wear allowances reduced to a minimum, manufacturing tolerances are automatically increased. Important and expensive parts made to close limits are not rejected because of inaccurate inspection with gages of other materials which must be produced to allow for customary wear.

Carboloy plug, ring, thread plug, and sizing gages and many precision tools are promptly available from Lincoln Park—the company that has had wider experience in the use of this wear-resistant material for precision applications than any other manufacturer. Our new catalog contains complete information. Write for it today.

ARMY (E) NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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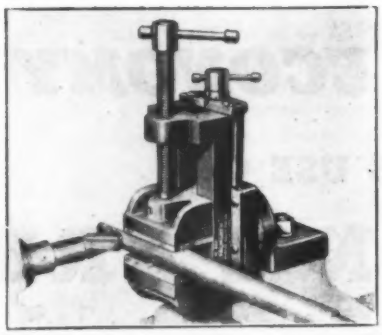
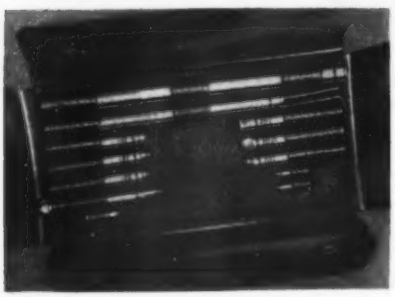


Palmgren milling attachment

Palmgren Milling Attachment Broadens Engine Lathe Uses

The No. 250 Palmgren milling attachement, available from Chicago Tool & Engineering Co., 8354 South Chicago Ave., Chicago 17, Ill., can be mounted on the cross slide of any standard engine lathe, making possible many intricate milling operations. By using the lathe's cross slide horizontal feeds and the Palmgren milling attachment's vertical feed and angle adjustments, a lathe is said to function as a universal milling machine.

The attachment has graduated screws for vertical adjustments and the base on which the vise rotates is graduted 360 deg. The vise has 2½ in. jaws with 2½ in. opening and grooves for holding round pieces.



General-Purpose diamond tool kit

General-Purpose Diamond Tool Kit Announced by Abrasive

The General-Purpose Diamond Tool Kit announced by the Abrasive Dressing Tool Co., Detroit, Mich., consists of ten diamond tools, two tool holders and two keys for locking tools in the holders. Included are diamond dressing tools, radius tools, cutting tools, phonopoints and a diamond scriber.

Each kit bears an identification number and provides a separate compartment for each tool, facilitating inventory and preventing loss.

Kidde System Makes Large Volume Degreasing Fire-Safe

Walter Kidde & Co., 88 West St., New York, N. Y., has devised built-in fire extinguishing systems for various types of washing and degreasing equipment. Upon combustion, these systems rapidly discharge a large volume of carbon dioxide which surrounds and extinguishes the flame.

The automatic washing machines manufactured by Industrial Washing Machine Corporation and Detrex Corporation have Kidde built-in automatic fire-fighting systems.

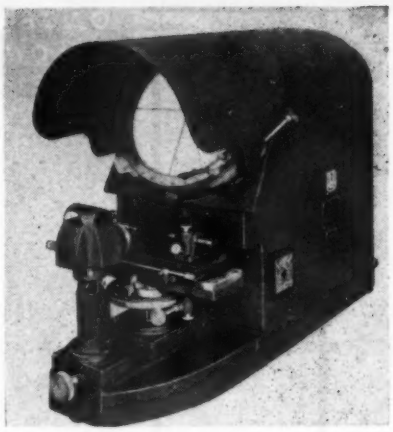
The system which automatically throws the fire-fighting system into action also closes all vent openings and louvres and shuts off the motors on the fan and pumps. The carbon dioxide has no deteriorating effect upon anything it touches.

Identometer metal identifier

Identometer Electronic Timing Control Eliminates Human Factor

The Identometer, manufactured by American Tubular Elevator Co., and distributed by Dravo Corporation, 300 Penn Ave., Pittsburgh 22, Pa., identifies rolled or ferrous alloy. This is accomplished by providing a known sample against which the unknown pieces are checked quickly.

The device speeds up the identification work to a point where it is possible, with a comparatively inexperienced operator, to keep pace with assembly line speeds. Electronic timing control eliminates the human factor in timing tests, the operator merely attaching the material, snapping the impulse switch and waiting until the proper light indicates completion of the test.



Jones & Lamson 14 in. comparator

J. & L. 14 Inch Bench Optical Comparator, Measuring Machine

The 14 in. Universal bench optical comparator and measuring machine, manufactured by Jones & Lamson Machine Co., Springfield, Vt., has a table 16 in. long and will measure lead and spacing up to 2 in. A handwheel graduated in 0.0001 in. operates on a hardened and ground thread spindle for making vertical measurements up to 1¾ in.

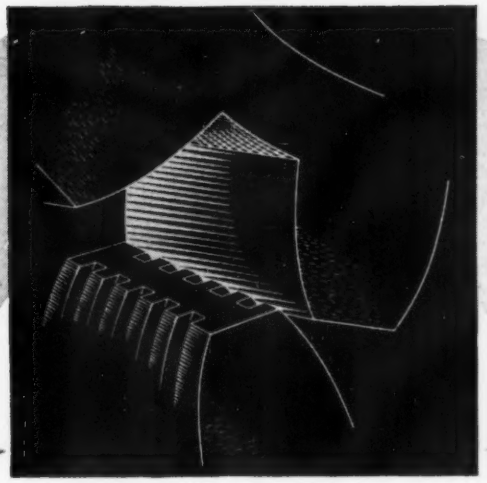
On one end of the table is a vernier segment with provision for compounding the table 15 deg. either side of center, for projecting hobs, worms and threads normal to their helix angle. An angle measuring attachment is provided for measuring angles in degrees and minutes.

The maximum height of the lens above the table is 3 in. and centers are available for staging objects up to 3 in. dia. by 11 in. length. There may also be used with this machine the vise stage, right angle stage, 1 in. V-block and the reflection attachment.

Lenses available will project a 1.4 in. area at 10 magnifications, a 0.7 in. area at 20 magnifications, 7/32 at 62½, 9/32 at 50 or a 13/32 at 31¼.

G-E Electric Truck Battery Charger Is Announced

The production of a new large capacity automatic copper-oxide battery charger, 145F1, for charging electric truck batteries electric truck battery charger, 145F1, is announced by the Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn. It is capable of charging 30 nickel-alkaline or 24 lead-acid battery cells. It is designed specifically for applications using both lead-acid and nickel-alkaline batteries. It operates from 3 phase a.c. power and automatically shuts off when the charge is completed.



There Are

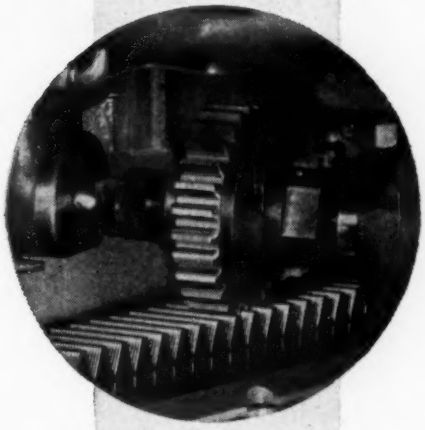
TWO WAYS

To Obtain

PRECISION GEARS

at

LOW COST



RACK SHAVING:

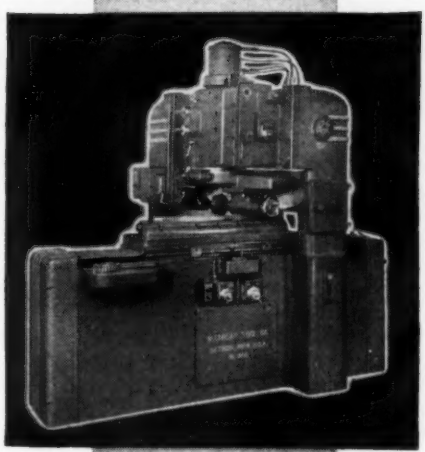
In high production there is no substitute for rack-shaving either as to precision obtainable or as to cost per gear.

Ask for Bulletin 900

ROTARY SHAVING:

Where varieties of gears in semi-production are to be produced or where quantities are lower, rotary shaving will produce gears at lower cost.

Ask for Bulletin 860



The whole story is told in Manual GF-43 available from

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD **DETROIT 12, U. S. A.**

DoAll Gage Set Produces any Precision Measurement Size

Through a careful selection of sizes and inclusion of plenty of thin blocks, DoAll Gage Set No. 118, manufactured by Continental Machines, Inc., 1301 Washington Ave., So., Minneapolis 4, Minn., makes possible the production of any size

DoAll No. 118 gage set

required in precision measurement.

Sizes of the 116 blocks range from 0.010 to 4.000 in. They are divided into three nine-block series of thin blocks—in steps of 0.01, 0.001 and 0.0001, respectively, ranging from 0.010 to 0.0209—and five master series. Of the latter, the 0.0001 increment series of nine blocks range from 0.1001 to 0.1009, the 0.001 series of 53 blocks from 0.101 to 0.190, the 0.050 series of 19 blocks from 0.100 to 0.950, the fraction series of three blocks from 1/32 to 1/16 and the 1.000 series of 4 blocks from 1.000 to 4.000 in.

The set includes two 0.050 tungsten carbide wear blocks. The set is available in three grades of accuracy: 0.000002 in. for laboratory use; 0.000004 in. for general inspection and 0.000008 in., the working set. These blocks have a hardness of Rockwell C-65.

Crane Synthetic Rubber Shaft Seal Unit is Now Available

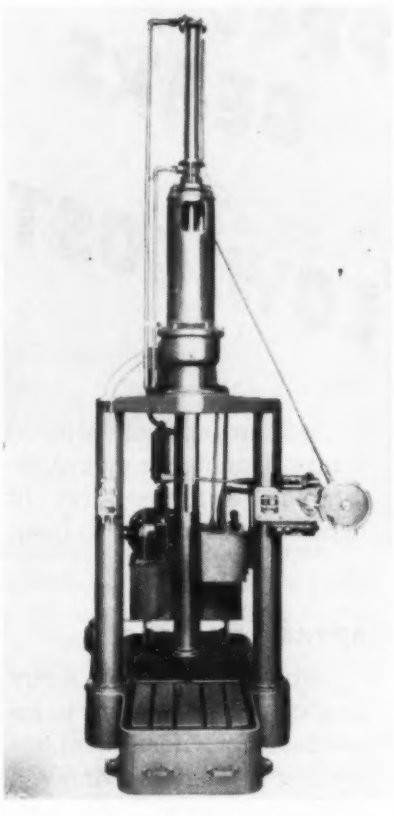
Furnished by the Crane Packing Co., 1839 Cuyler Ave., Chicago 13, Ill., the bellows-type shaft seal consists basically of a flexible synthetic rubber bellows, the tail end of which grips and seals along the shaft; a stationary floating seat, held in a synthetic-rubber sealing ring; and a positively driven sealing washer that turns with the shaft and is held against the stationary seat by spring pressure. The contacting faces of the washer and seat are lapped to form a leak-proof seal.

The flexing head of the bellows offers no resistance to the spring. This design allows the sealing washer to remain in contact with the seat as the sealing faces wear, and provides automatic compensation for shaft vibration and end-play. The synthetic-rubber stock used has maximum resistance to oil, hydrocarbons, refrigerants, water and anti-freeze solutions.

Fulmer Machine Laps or Hones Cylinders Rapidly, Accurately

C. Allen Fulmer Co., 1217 First National Bank Bldg., Cincinnati, Ohio, announces a machine for rapid honing or lapping of cylinders to 20 in. inside dia, and up to 72 in. length. Working tolerances of 0.0002 in. are said to be possible.

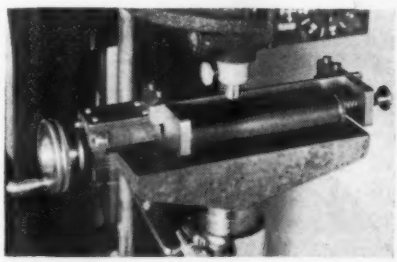
Controls are at the front of the machine within easy reach of the operator. According to the manufacture, a sto pand dwell system" makes it possible to stop the spindle at any point without shock or impact to the machine or work. Electrical timing makes it possible to hold the spindle at this point for from 1 to 30 seconds.



Fulmer Honing Machine

Eastern Air Devices Model J 80A Axial Flow Blower Ready

The Model J 80A axial flow blower, manufactured by Eastern Air Devices, Inc., 585 Dean St., Brooklyn 17, N. Y., delivers 170 cu. ft. per min. of air (NEMA code) and operates on 115 v. 60 cycle, single phase current. Speed is 3,100 r.p.m. Input is 12 watts and starting torque is 1 oz.-in. Motor diameter is 1¾ in., fan diameter is 4 in. and over-all length is 3-11/16 in. Weight is 16.5 oz.



Precision indexing fixture

Precision Mounting Press and Indexing Fixture Are Ready

Precision Scientific Co., 1750 N. Springfield Ave., Chicago 47, Ill., announces two new pieces of apparatus for the metallurgical laboratory.

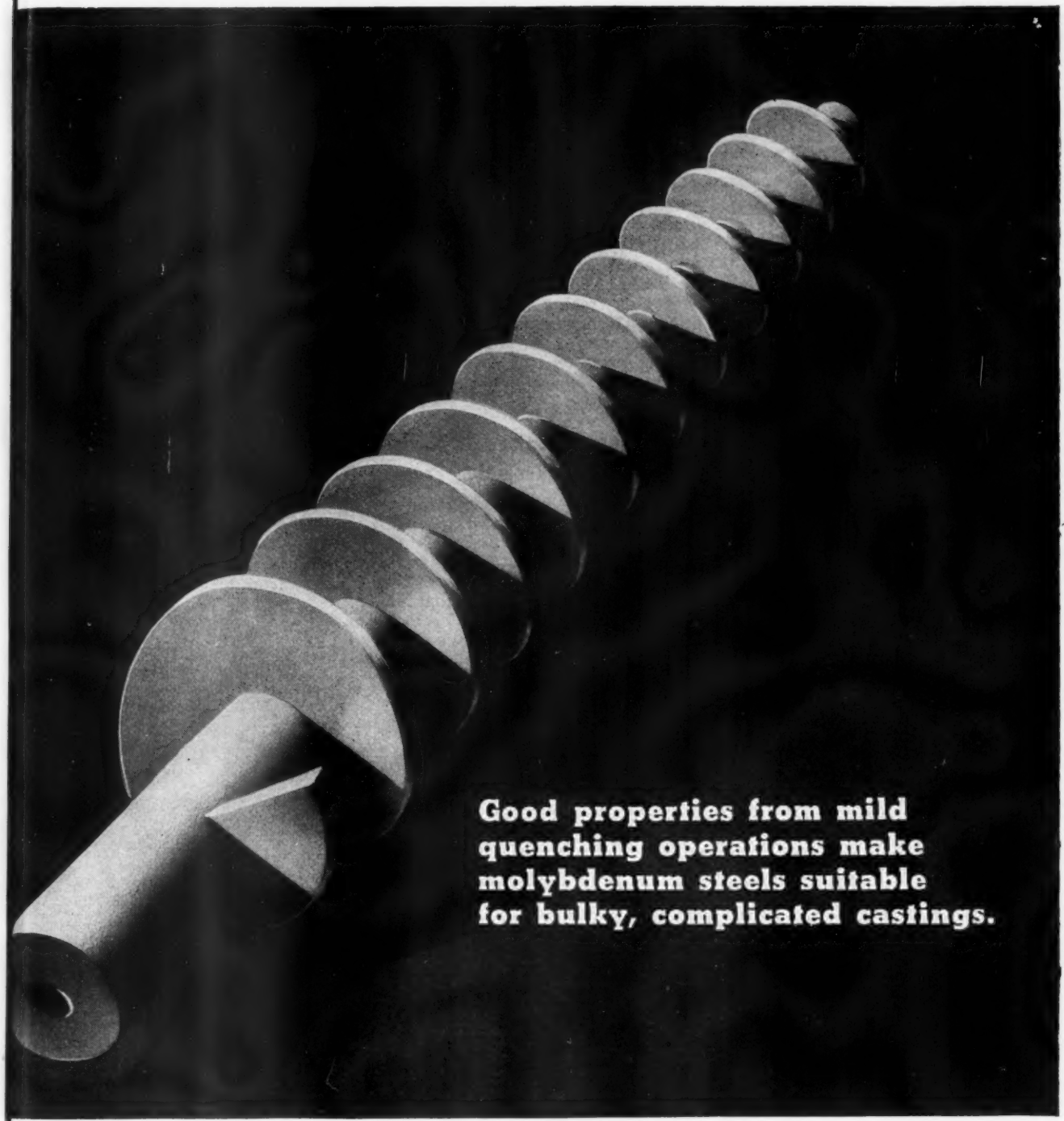
An indexing fixture of Jominy hardenability bars mounts on Clark or Wilson hardness testing machines and consists mainly of a heavy rigid base casting, indexing screw and quick return mechanism.

A semi-automatic air operated specimen mounting press is set by a constant pressure reducing valve, thereby eliminating the need of a hand operated hydraulic jack to maintain pressure on specimens while curing. This feature is said to assure uniform specimens identical in size and hardness, while improving polishing characteristics and greatly reducing the operator's time.

Precision specimen mounting press

Correction

In describing the Barnes hydraulic cylinders, page 130, December 21, 1944, the last line of the announcement should have read "pressure to 3,000 lb. per sq.in."



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

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Climax Molybdenum Company

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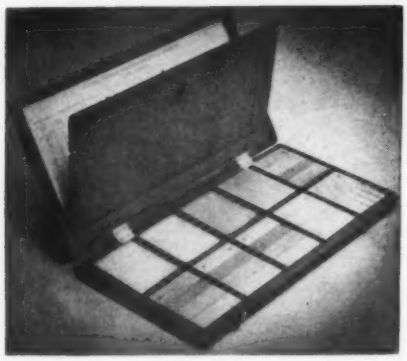
MOLY



G. E. surface roughness specimens

G.E. Surface Roughness Specimens Aid Specification

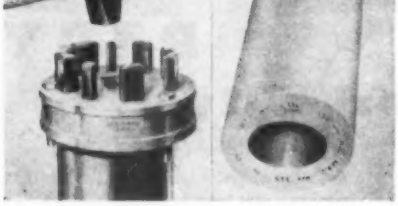
A set of standard surface-roughness specimens, each representing one clearly identified degree of surface roughness ranging from the smoothness of a bearing surface to the roughness of a flame cut, has been announced by the Special Products Division, General Electric Co., Schenectady, N. Y. The new specimens are designed to facilitate selection and specification by symbol the degree of surface roughness allowed for a particular part.

The set consists of ten metal specimens, each 2 × 2½ × ⅛ in., and several divided into two or four surfaces. Each of the 25 surfaces represent the roughest one acceptable for that particular symbol.

Acromark Masking Die Holder Boosts Speed and Accuracy

A masking die holder manufactured by The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J., is intended to assure speed and accuracy in the marking of parts too large for handling in power operated equipment. The fixture holds the entire set of stamps in position, with the aid of guide pins and bars to assure accuracy. After placing, each stamp is hit with a hammer.

Individual sections of the marking may be changed as required.



Acromark masking die holder and marked muzzle

Craftint Field Sketching Block Needs no Rulers or T-Squares

A sketching block, available from Craftint Mfg. Co., 210 St. Clair Ave., N.W., Cleveland, Ohio, is intended for making sketches in the field and eliminates the need of rulers and T-squares. The block has a patented non-slip cover with four separate "wings" that are imprinted with 1/10, 1/8, 1/4 and 1/2 in. scales, plus an isometric chart over a 1/8 in. scale. The block contains 75 sheets of tracing vellum in sheets of 9 x 12 in. and is so constructed that any one of the attached scales can be inserted directly beneath the tracing paper.

Filing Space Saved by Microcopy Translite Hi-Reduction Process

Application of microfilming to engineering drawings and other records is accomplished with the Translite Hi-Reduction process of the Microcopy Corp., 2800 W. Olive Ave., Burbank, Calif. Photographs are on a continuous roll. From 90 to 98 percent filming space is saved. Duplicates can be reproduced on film, paper, tracing paper or cloth, or enlarged in a Multiple-Magnification viewer for direct consideration.

New Method Round Face Stamps Lessen Crack Danger

"Round Face" hand stamps, intended for low stress marking of lightweight alloy forgings and castings are available from New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich. Both face and impression are rounded on these new stamps, lessening the chance of cracks starting in the forgings or castings so marked. All characters have impressions not deeper than 0.003 in. and fillets (radius of curve) of not less than 0.006 in. at all intersecting surfaces of an impression.

New Method Round Face stamps

Machine Products round surface plate

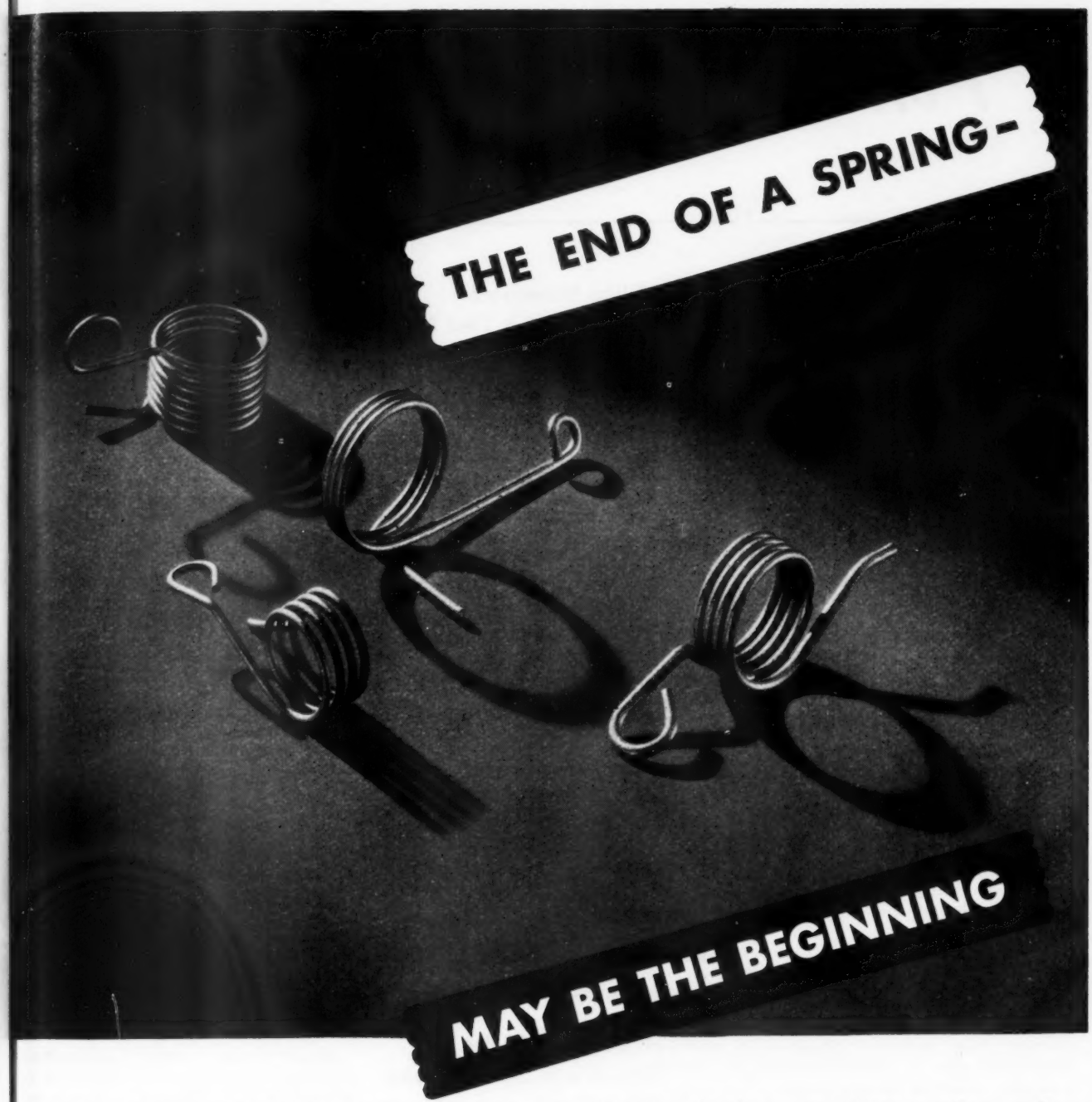
Machine Products Announces New Round Surface Plate

A round surface plate announced by Machine Products Corp., Detroit 12, Mich., measures 102 in. dia., and is of approximately 18½ in. depth. It is cast of Meehanite iron with the entire face precision scraped. The Machine Products round surface plate is said to give increased availability from all sides.

Vibrograph in operation

Westinghouse Vibrograph Tapes Vibration on Location

The Vibrograph, manufactured by Westinghouse Electric and Mfg. Co., E. Pittsburgh, Pa., weighs less than nine lb., requires no power connection and writes permanent record of vibrations over a range of 600 to 15,000 cycles per min. It will record amplitudes as low as one ten thousandth of an inch or as great as one sixteenth of an inch. The record and a timing wave are drawn by a stylus on a transparent plastic tape 1 in. wide, and is viewed by a low-power microscope.

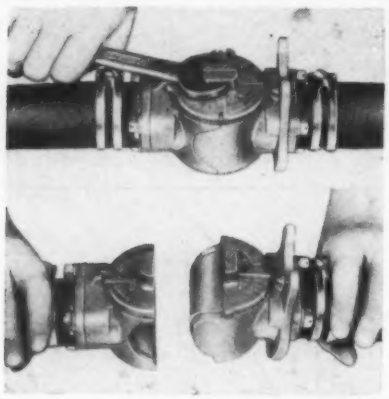


...of a more successful design for your product, with new adaptations, new uses, and new possibilities. For the types of ends possible on torsion springs are practically unlimited in size and shape. But engineering the best spring end for your application requires experience in design—making it calls for great skill in tooling, and extensive production machinery. That's exactly why you should turn to Muehlhausen engineers for solution to your difficult spring problems.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
125 Michigan Avenue, Logansport, Indiana

MUEHLHAUSEN
SPRINGS
EVERY TYPE AND SIZE

Parts and Materials



Thompson Quick Disconnect Coupling

Thompson Quick Disconnect Coupling Speeds Hose Joining

The Quick Disconnect Coupling manufactured by Thompson Products, Inc., Cleveland, Ohio, is a plug type valve or cock designed for speedy, easy and positive coupling and uncoupling of hose lines without loss of fluid. The coupling may be connected or disconnected by turning the cylinder one quarter of a turn.

The coupling is said to provide a positive shut-off, preventing leakage and spillage and the subsequent formation of hazardous vapors, even when subjected to vibration, impulse pressure, heat and cold. If desired, either half can be opened to allow drainage. Stops prevent rotation to a point causing unintentional disassembly of the parts.

Univac Gives Faster Brake Action at Less Pedal Pressure

The Univac brake intensifier, available from Pesco Products Co., Cleveland 6, Ohio, is said to make possible faster braking action and lower pedal pressure on aircraft power braking systems. Operating in conjunction with a vacuum pump mounted on the engine, the unit produces the desired braking pressure at a pedal force of 50 lb. It is connected anywhere in the line between the master cylinder and the wheel brake and is a self-contained unit weighing 5 lb. Little piping and no levers or rods are required.

Kindt-Collins Waterproof Fillet Cement is Time Saving

A waterproof fillet cement for pattern making, developed by the Kindt-Collins Co., 12651 Elmwood Ave., Cleveland, Ohio, is said to save time and labor in the pattern shop. Because sand will not stick to the edges of the fillet on which it has been used, it will help to produce better castings and save time in the foundry cleaning room.

Employing neither water nor alcohol as a solvent, the cement is impervious to moisture and other deteriorating influences. It is not affected by the heat of sand in high production foundries. It is used for leather, wood and plastic fillets and wood or metal patterns.

Stalock quick-fastening lock nut

Adel Stalock Has 360 deg. Contact with Screw Threads

Production of Stalock, a spring steel, quick-fastening lock nut which offers 360 deg. contact with screw threads, is announced by Adel Precision Products Corp., Burbank, Calif.

Tests are said to show that the fastener meets all demands of light assemblies with performance far exceeding AAF Specifications No. 25533. Vibration requirements are exceeded by four times. Under tension tests, states the manufacturer, screw threads failed while fastener retained all original values. The nut is re-usable.

A wide variety of Stalock fasteners are furnished in two types: for sheet metal screws, standard sizes Nos. 4, 6, 8, 10 and 14; for coarse machine screw threads Nos. 6, 8, 10, ¼ in. and 5/16 in. Special shapes and sizes will be made on order.

Precision protectors

Precision Protectors for Threaded and Machined Parts

Precision Paper Tube Co., 2033 West Charleston St., Chicago 47, Ill., offers thread protectors and dust caps of spiral-wound fibre, kraft paper or cellulose acetate, made under heat-treated compression. These protectors are produced with tolerances as close as ± 0.003 in. Desired information can be printed on the protector.

Colonial Makes Neutral Cleaner And a Degreasing Solution

Technical Processes Division, Colonial Alloys Co.; Philadelphia 29, Pa., announces a metal degreasing solution for degreasing machines and an all-purpose solvent metal degreaser and cleaner.

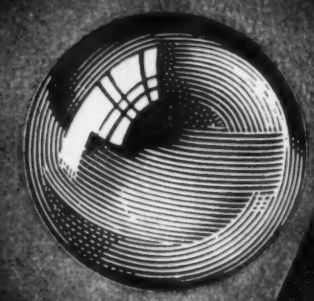
Percyclodiene metal degreasing solution for degreasing machines is described as non-toxic and non-corrosive. With it, degreasing machines are operated at from 180 to 250 F., in cleaning cycles ranging from two to five minutes. The flash point of this solution is 325 F.

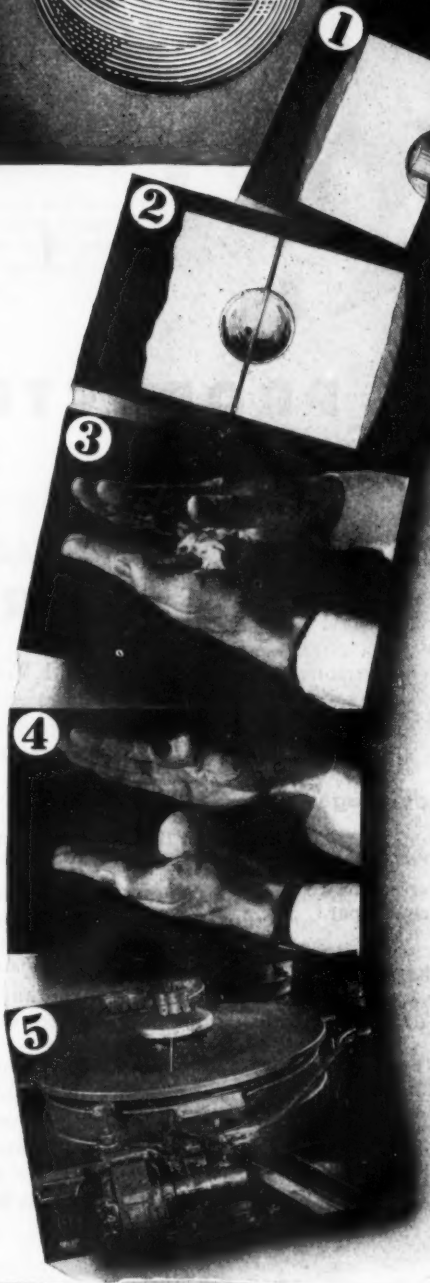
Cyclodiene FN all-purpose single-operation solvent metal degreaser and cleaner contains a finger print and body acid neutralizer. Used at room temperature, the work is immersed into or sprayed with Cyclodiene FN. No special equipment is required.

Potter & Brumfield Circuit Switching Relays Small, Light

Two new relays designed for circuit switching have been announced by Potter and Brumfield Manufac-

But how do they make 'em so ROUND?



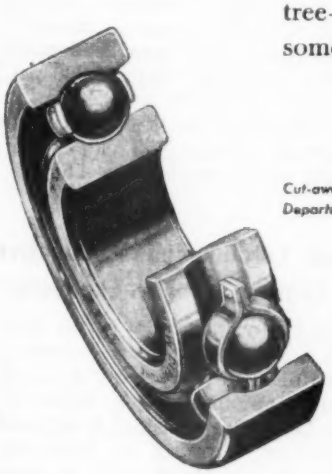


While the steel ball is but one little part of a ball bearing, it's a most important part—and making it "round" is a most important and interesting process.

The extreme precision limits obtained (such as diameter within *two one-hundred-thousandths of an inch*) and interesting facts regarding the wonderful strength of the steel ball, are among the subjects covered in our little Booklet "BM".

We will be delighted to send you one for the asking.

Meanwhile, remember that every mechanical device that helps make our civilization possible, has ball bearings in its family tree—somewhere—somehow!



Cut-away view of New Departure Ball Bearing

1 Slug of steel wire is placed between accurately formed dies.

2 Under heavy pressure, dies forge slug into a rough ball with minimum of "flash".

3 & 4 Grinding to perfection of diameter and sphericity is done in very much the same way that human hands can roll a ball from a lump of putty.

5 Final grinding and lapping polishes sphere to a brilliant finish—not for "looks", but for *perfection* of form and size.

nothing rolls like a ball

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE · DIVISION OF GENERAL MOTORS · BRISTOL, CONNECTICUT

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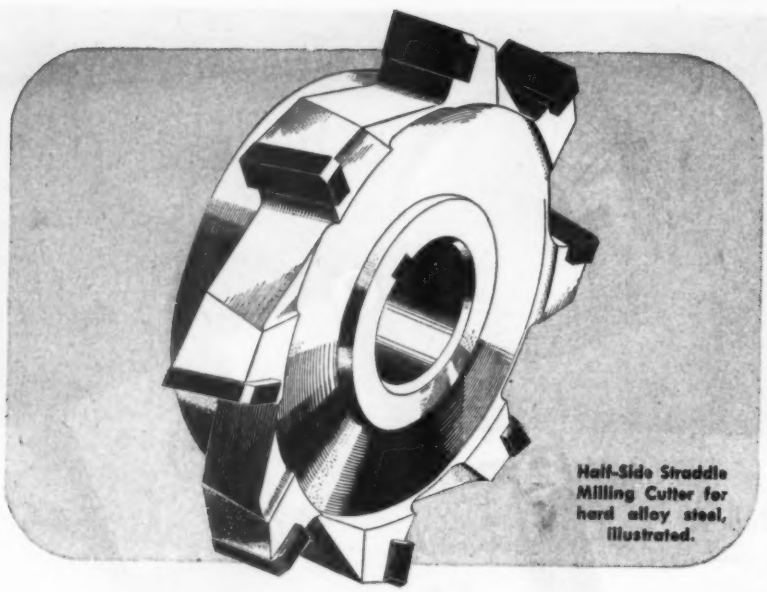


Half-Side Straddle Milling Cutter for hard alloy steel, illustrated.

INCREASE PRODUCTION

as many as

10 TIMES

with these new standard carbide tipped

MILLING CUTTERS

IT'S EASY to increase production as many as 10 times with Wendt-Sonis Standard Milling Cutters. These new milling cutters employ a negative radial and helix angle feature on the cutting edge for milling steel; positive angle for milling non-ferrous materials.

Distinctive Advantages of W-S Milling Cutters

INCREASED SURFACE FEED—Machines hard alloy steel up to 750 surface feet per minute; non-ferrous materials up to 3400 surface feet per minute.

PREVENTS VIBRATION—The built-in heavy lug fly-wheel prevents vibration, adds strength to cutters; lengthens life of tool between sharpenings.

ESPECIALLY DESIGNED—for carbide cutting—not just a HSS design with carbide tips. Recommended for milling all types of material.

EASILY RESHARPENED—on any universal tool and cutter grinder.

Carbide Tipped Tools are a specialty with us. We make them exclusively. Our experience, research, development and improvements are your assurance of complete satisfaction when you use W-S Carbide Tipped Tools. Refer to "TOOLS" in your Classified Telephone Directory, for your local W-S Distributor, or write WENDT-SONIS COMPANY, HANNIBAL, MISSOURI. Branch Warehouse: LONG BEACH, CALIFORNIA.

Free!

Now! CATALOG 144. Contains data and latest prices on W-S Standard Milling Cutters plus many other standardized carbide-tipped tools formerly classed as "special." WRITE TODAY for FREE copy.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • ROUTER BITS • SPECIAL TOOLS

turing Co., 106 N. First St., Princeton, Ind. KR series is designed for applications where size and weight are important factors. Where current is not too limited, the d.c. types can be adjusted to withstand the vibration encountered in most aircraft applications. Coils are available for up to 100 v., 60 cycles, a.c., or 60 volts d.c.

The KL series have approximately twice as much coil space and a larger number of poles than the KR series. These relays operate on values as low as 0.2 watts., combining sensitivity and the wiping action of a spring-mounted contact. Coils are supplied for voltages up to 220 v., 60 cycles or 100 v., d.c.

For each type, fine silver contacts are rated at 3 amp., 100 v., 60 cycles, non-inductive.

Master Cam-Lever Switch Announced by General Control

Master cam-lever switch model ML-C5, manufactured by General Control Co., 1200 Soldiers Field Rd., Boston 34, Mass., has a positive-positioning cam that has roller detents which eliminate friction and contact bounce. Rating is 10 amp., 125 v., a.c. and 2 amp., 125 v., d.c.

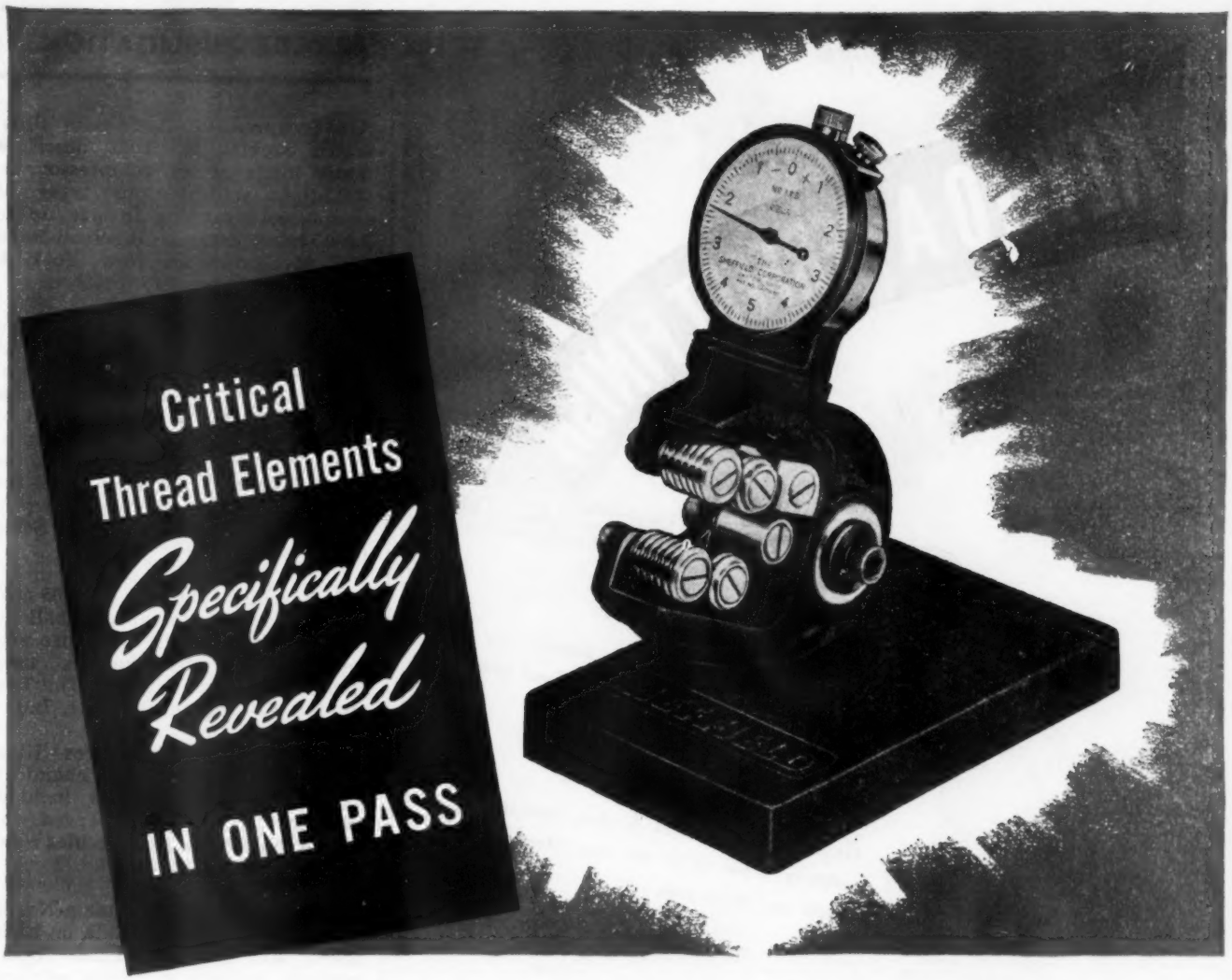
Resinox Has Low Dielectric Constant Low Water Absorption

Resinox 7934 mica-filled molding compound developed by Monsanto Chemical Co., St. Louis 4, Mo., designed for use as an insulating medium in high frequency apparatus, has low dielectric constant and power factor, especially low water and moisture absorption and relatively high heat resistance. Specific gravity is 1.76; flexural strength, 9,000 to 10,000 psi.; max. deflection, 0.024 in.; tensile strength, 6,000 psi.; impact strength, 0.35 to 0.40 ft. lb. per in. of notch; dielectric strength at 60 cycles, 350 to 450 v. per mil; dielectric constant, 4.20 to 4.50.

Du Pont Ceramic-Type Conductive Coating for Non-Conductors

Non-conductors can be given conductive coatings with a ceramic-type material developed by E. I.. du Pont de Nemours & Co., Wilmington 98, Del. The material is applied by spraying, dipping or brushing, followed by air drying and, in some cases, baking. Containing silver powder, the coating produces a surface of low electrical resistance and high conductivity.

Aging or exposure to sulfides has only slight effect upon the conductivity of the coating. The coating is dull, metallic gray in appearance.



The Sheffield THREDCHEK provides a more *specific* and *accurate* check of critical thread elements than the conventional *collective* check.

Two GO rolls serve to pass parts that are not oversize and which *will* assemble. These rolls screen out parts which are oversize or which will not assemble because of an excessive error or combination of such errors in lead, angle and pitch diameter.

As the parts are passed from the GO or assembly rolls and are presented to the two NOT GO rolls, one of which is mounted so as to actuate a dial indicator, the dial shows whether the pitch diameter is too small and *by how much*. Should the pitch diameter show as being within tolerance limits and near basic, then it can be assumed that lead and angle are not only within tolerance limits but are also of the highest dimensional quality.

A free-rotating backstop enables the part to be properly located for accurate checking and also permits checking for out-of-round. The backstop, together with the indicator, eliminates the need for a trained sense of "feel" in making the NOT GO check—a most important advantage of the THREDCHEK.

Both sets of rolls are PRECISIONPLATE—Sheffield precision chrome plate—for longer life. Full manufacturing tolerances may be utilized because wear allowance is compensated by adjusting the rolls on their eccentric axis. The open end style permits checking close to a shoulder.

THREDCHEKS are available in frame sizes corresponding closely to Sheffield Thread Roll-Snap Gages, with standard or special pitch rolls. *Write for engineering data "Instruments #8".*

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

SHEFFIELD MASTER CRAFTSMEN

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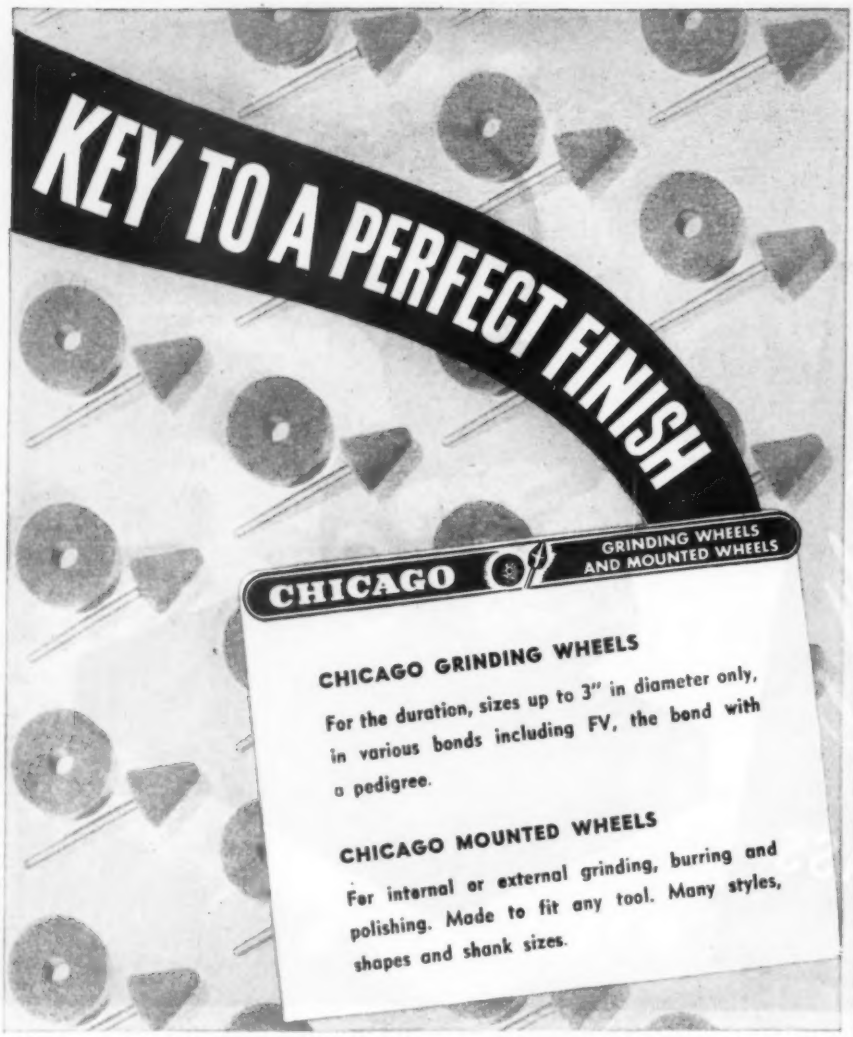
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GRINDING WHEELS AND MOUNTED WHEELS
CHICAGO GRINDING WHEELS
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For internal or external grinding, burring and polishing. Made to fit any tool. Many styles, shapes and shank sizes.

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There's half a century of experience behind this, fifty years of specializing on grinding wheels—grinding wheels with hundreds of varieties in shape, size, abrasive and bond formulas, engineered for the right tool speed and work pressure.

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Send catalog. Interested in
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☐ Send test wheel

Name .....
Size .....
Address .....

TRADE PUBLICATIONS

Air Compressors—A 24-page illustrated booklet, No. 1011, describes many kinds of air compressor installations and various types of compressors ranging in size up to 3,000 horsepower. Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

Arc Furnaces—An illustrated pamphlet of 20 pages, No. GEA 4246, describes electrical equipment for arc furnaces with KVA ratings between 500 and 7,500 controlled by electronic devices which automatically regulate the power input to the requirements of the furnace and the charge. Manual control is also provided. General Electric Co., Schenectady, N. Y.

Ball Bearings—Bulletin No. 105 covers the use of high-capacity ball reciprocating bearings, with size recommendations for various uses. Bantam Bearings Division, The Torrington Co., South Bend 21, Ind.

Chemicals and Explosives—Illustrated, 38-page booklet on chemicals and industrial explosives includes an index of industries served and the products supplied. Hercules Powder Co., Wilmington, Del.

Drills and Reamers—Catalog No. 39, of 146 pages, contains data on high-speed and special purpose drills, reamers, sockets, mandrels, oils and compounds, with several sections of data on drill point recommendations, cutting speeds and decimal equivalents. Chicago-Latrobe Twist Drill Works, 417 W. Ontario St., Chicago, Ill.

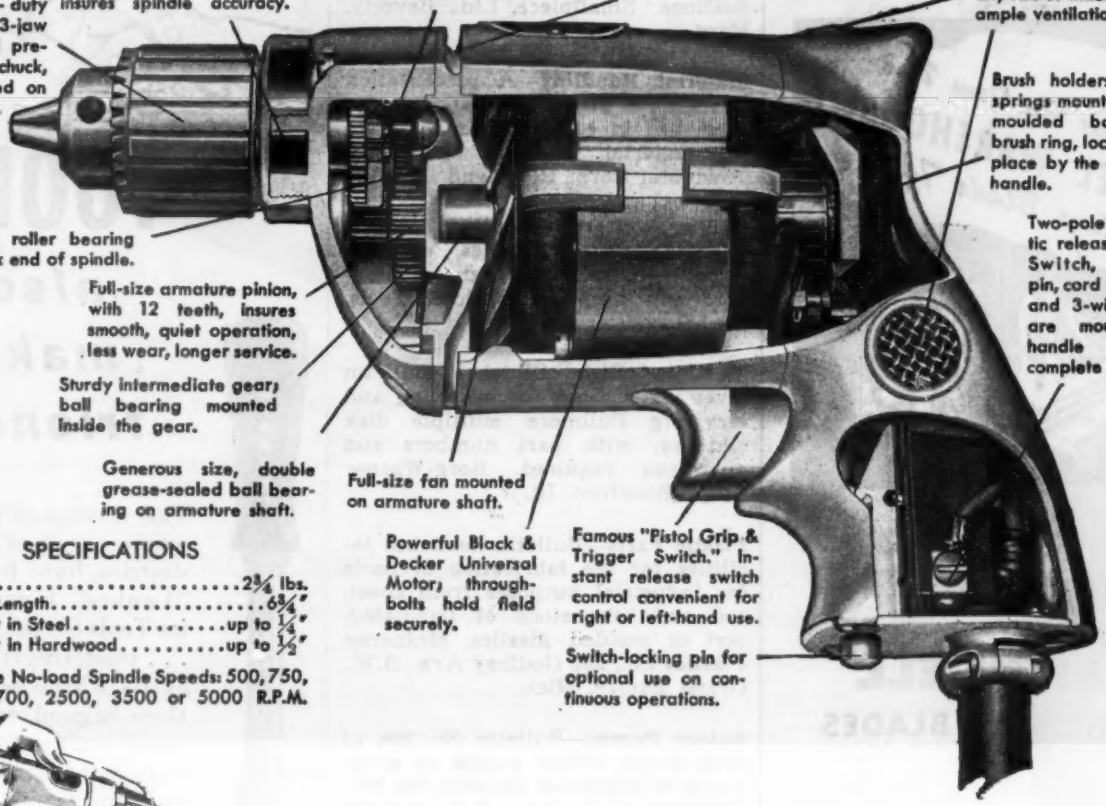
Electrical Equipment—Fall 1944 edition of a 74-page abridged catalog contains many electrical products not included in previous editions. Square D Co., 6060 Rivard St., Detroit 11, Mich.

Flexible Shafting—Book 449, of 28 pages, gives design and technical details of flexible shaft remote valve operating gear. Stow Mfg. Co., Binghamton, N. Y.

Gear-Finishing Machines—Technical Bulletin No. 860-B-44 describes the complete line of Model 860-B gear-finishing machines and contains complete specifications. Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich.

Heat-Treatment Data—A brochure of data on the heat-treatment of alloy steels "Interpreting Hardenability" contains explanations and interpretations of tests made on such

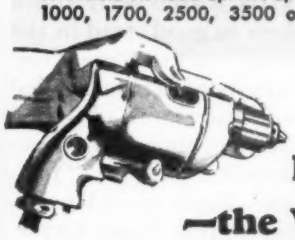
The Service you get out of tools depends on what's *built into* them


Deep-groove ball bearing on chuck spindle with inner and outer races locked in place — minimizes wear, insures spindle accuracy.
Splined mounting of spindle gear increases strength, facilitates inspection, reduces noise, friction, wear.
Ample air outlet slots prevent clogging of the ventilating system.
Three screened air inlets (on top and both sides), any two of which provide ample ventilation.
Heavy-duty Jacobs 3-jaw geared precision chuck, threaded on spindle.
Brush holders and springs mounted on moulded bakelite brush ring, locked in place by the switch handle.
Needle roller bearing on back end of spindle.
Two-pole automatic release switch. Switch, locking pin, cord protector and 3-wire cable are mounted in handle as one complete unit.
Full-size armature pinion, with 12 teeth, insures smooth, quiet operation, less wear, longer service.
Sturdy intermediate gear, ball bearing mounted inside the gear.
Generous size, double grease-sealed ball bearing on armature shaft.
Full-size fan mounted on armature shaft.
Powerful Black & Decker Universal Motor, through-bolts hold field securely.
Famous "Pistol Grip & Trigger Switch." Instant release switch control convenient for right or left-hand use.
Switch-locking pin for optional use on continuous operations.

SPECIFICATIONS

Weight.....2¾ lbs.
Overall Length.....6¾"
Capacity in Steel.....up to ¼"
Capacity in Hardwood.....up to ½"

Available No-load Spindle Speeds: 500, 750, 1000, 1700, 2500, 3500 or 5000 R.P.M.



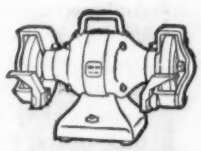
Look Inside the Black & Decker Holgun —the World's Most Widely Used Electric Drill

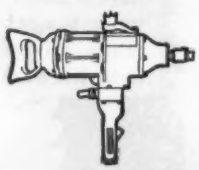
ABOVE you see some of the built-in reasons why the Black & Decker Holgun is the most popular electric drill in the world. And those built-in reasons are typical of the unseen values you get when you buy any Black & Decker Tool.

You get a product of engineering leadership and precision workmanship. You get a tool in which each part is specifically designed and made for the particular job it has to do. You get, for example, gears designed and cut by Black & Decker . . . and checked on precision testing equipment to insure a smooth and noiseless flow of maximum power from motor to chuck.

Such unseen values as these—which have made Black & Decker the world's largest manufacturer of portable electric tools—help explain why any Black & Decker Tool gives you more service, more efficiency, more downright satisfaction.

For help on any tooling problem, now or in your postwar planning, call your nearby Black & Decker Distributor. The Black & Decker Mfg. Co., 716 Pennsylvania Ave., Towson-4, Maryland.


BENCH GRINDERS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An Eastern warehouse, specializing in alloy steels, including stainless, conducted their own tests of hack saw blades. On the basis of their records they selected and placed their orders for Capewell's tough *Technite* hack saw blades. Do you have a metal sawing job that requires tough blades? Then ask your mill supply house about Capewell's long-life hack saw blades.

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The trend is to TECHNITE
the molybdenum high speed hack saw blade

THE CAPEWELL MFG. CO.
Hartford, 2, Conn.

stock. Joseph T. Ryerson & Son, Inc., P.O. Box 484, Jersey City 3, N. J.

Industrial Electronics—A 40-page booklet, GEA 4309, contains reprints of eight articles on the use of electronics in industry. General Electric Co., Schenectady, N. Y.

Lathes—Illustrated pamphlet of multi-tool production lathes for small work includes detailed specifications. Smallpiece, Ltd., Beverly, Mass.

Material Handling—A presentation of methods used by stevedores who specialize in expediting many varied material handling operations. Towmotor Corp., Cleveland 10, Ohio.

Milling Cutters—Circulars describe triangular cutter blades, carbide-tipped face mills and high-speed arbors and adapters. Weddell Tools, Inc., Rochester 7, N. Y.

Multiple Disk Clutches—Bulletin gives instructions for installing and servicing Pullmore multiple disk clutches, with part numbers and quantities required. Borg-Warner Corp., Rockford, Ill.

Plastic Parts—Bulletin describes facilities for the fabrication of parts for industrial purposes from sheet, rod and tube stock of laminated, cast or molded plastics. McInerny Plastics Co., 655 Godfrey Ave., S.W., Grand Rapids, Mich.

Rotary Pumps—Bulletin No. 306, of facts about rotary pumps in a revision of Blackmer Bulletin No. 304. Contains a diagram that explains what happens inside a rotary pump. Blackmer Pump Co., Grand Rapids 9, Mich.

Silver Solder Flux—A four-page bulletin describes Superior No. 6 flux for silver soldering and gives detailed instructions for its use. Superior Flux Co., 913 Public Square Bldg., Cleveland, Ohio.

Splicing Clamps—Folder explains clamps with a copper base alloy for splicing electrical conductors and other similar uses. B. F. Goodrich Co., Akron, Ohio.

Thermostats—Bulletin on Type K thermostats for control of electrical devices between —120 F. and +600 F. United Electric Controls Co., 69-71 A St., Boston 27, Mass.

Voltage Supply Unit—Bulletin No. GEA 4317 on high-voltage d.c. supply equipment for testing, precipitation, induction heating and miscellaneous industrial and electronic applications which require high voltage. General Electric Co., Schenectady, N. Y.

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TOOLS
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Vast throngs of new shop workers, trained in war industries, have been using "Yankee" Fine Mechanics Tools for the first time . . . mastering fresh trade skills which will stand them in good stead in the peace years to come. They have learned what skilled mechanics and old-time factory men have long known . . . that "Yankee" Tools complete innumerable tasks *faster*, *easier*, and *better*. For half a century, the ingenuity of "Yankee" Tools has set a high record in speed and accuracy. The war has served to underscore that record.

Order from your industrial supply distributor, or write North Bros. Mfg. Co., Dept. AM-245, Phila., Pa.

"YANKEE" SPIRAL SCREW DRIVER No. 130A
A Size for Every Purpose

"YANKEE" TOOLS
make good mechanics better
North Bros. Mfg. Co., Phila. 33, U. S. A.
Established 1880

Makers, also, of "Yankee-Handyman" Tools

What to do about Rust?

Make this Test

Immerse any rusty nail in a small quantity of Cities Service Rust Remover. If badly rusted, allow to remain for several minutes. You can actually see the rust dissolve.

See the Results

Remove nail and wipe dry with cloth or tissue. Note the complete absence of rust and the way the original surface reappears.

CITIES SERVICE RUST REMOVER has been tested for four years throughout a small, highly industrialized area in the East, where it has earned a unique reputation for performance. RUST REMOVER is a clean, clear liquid, practically odorless, non-inflammable, easily applied, and harmless to handle by those not allergic to specific chemicals. It is fast-acting, and, although heating somewhat accelerates results, general application is recommended at normal temperature (60°-90°F.) RUST REMOVER is effective on chromium, copper, aluminum, steel and iron.

5 Big Advantages

1. Non-Inflammable
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4. Removes Rust by Chemical Action
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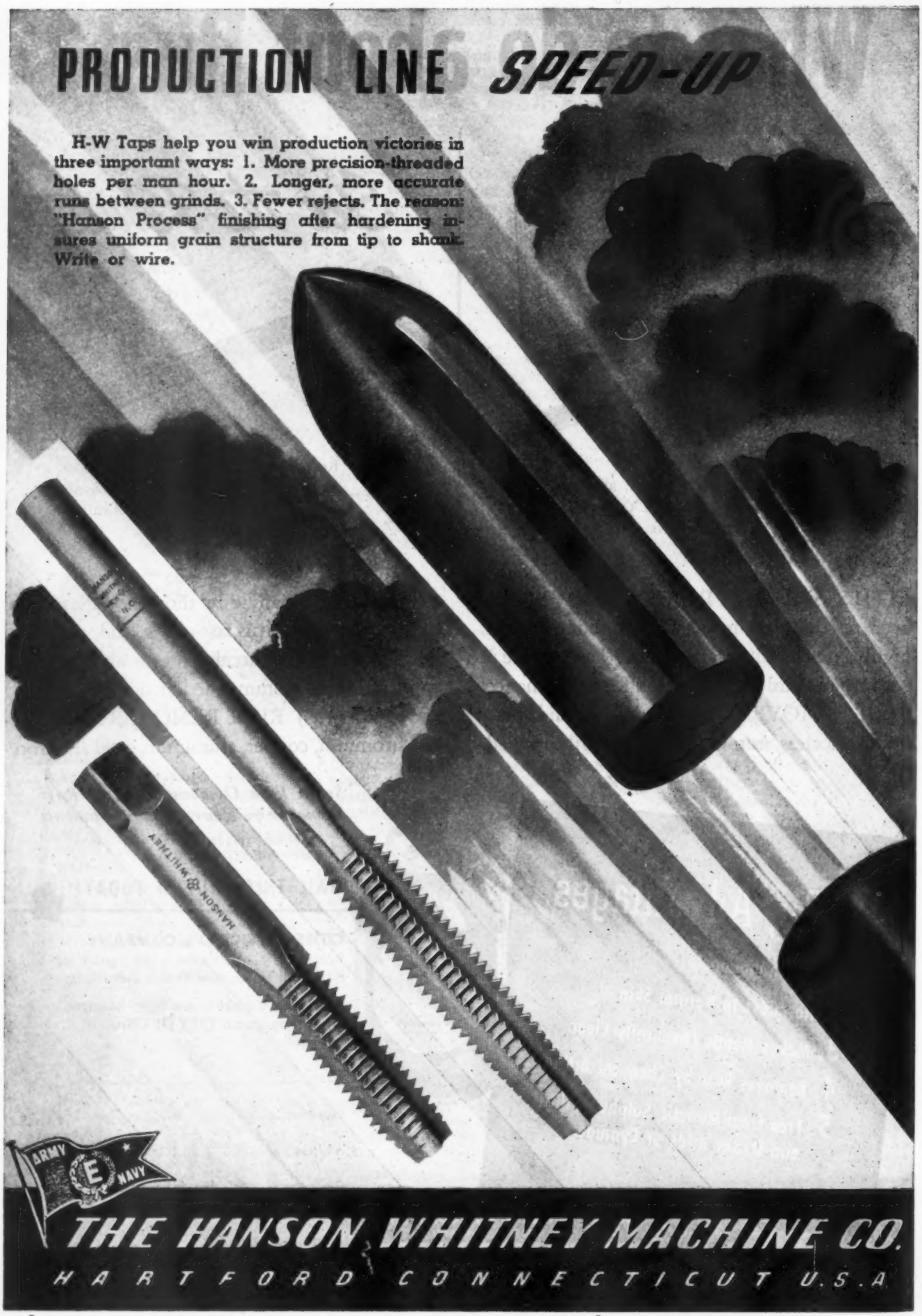
PRODUCTION LINE *SPEED-UP*

H-W Taps help you win production victories in three important ways: 1. More precision-threaded holes per man hour. 2. Longer, more accurate runs between grinds. 3. Fewer rejects. The reason: "Hanson Process" finishing after hardening insures uniform grain structure from tip to shank. Write or wire.



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THE RIGHT MEN— IN THE RIGHT PLANT— WITH THE RIGHT EQUIPMENT— and the Right Answers for YOU!

TRAINED, experienced, resourceful production men—a spacious, well-lighted, thoroughly modern plant—up-to-the-minute equipment—that's the Acme setup and it goes far toward explaining why Acme does a superior job.

We're proud of Acme people, Acme plants, Acme equipment; and we've told you about them in a new book you'll enjoy reading, called *Acme for Action*. Brief, factual, illustrated with some 150 photographs, this book will really acquaint you with the men who make Acme products and the place where those products are turned out.

Whether you need Acme Aluminum Alloy Permanent Mold castings—or dies, jigs, patterns—special tools for new or unusual jobs—or general engineering or production advice and suggestions—Acme men can find the right answer to your problem. Write today for *Acme for Action*, and your copy will be promptly forwarded.

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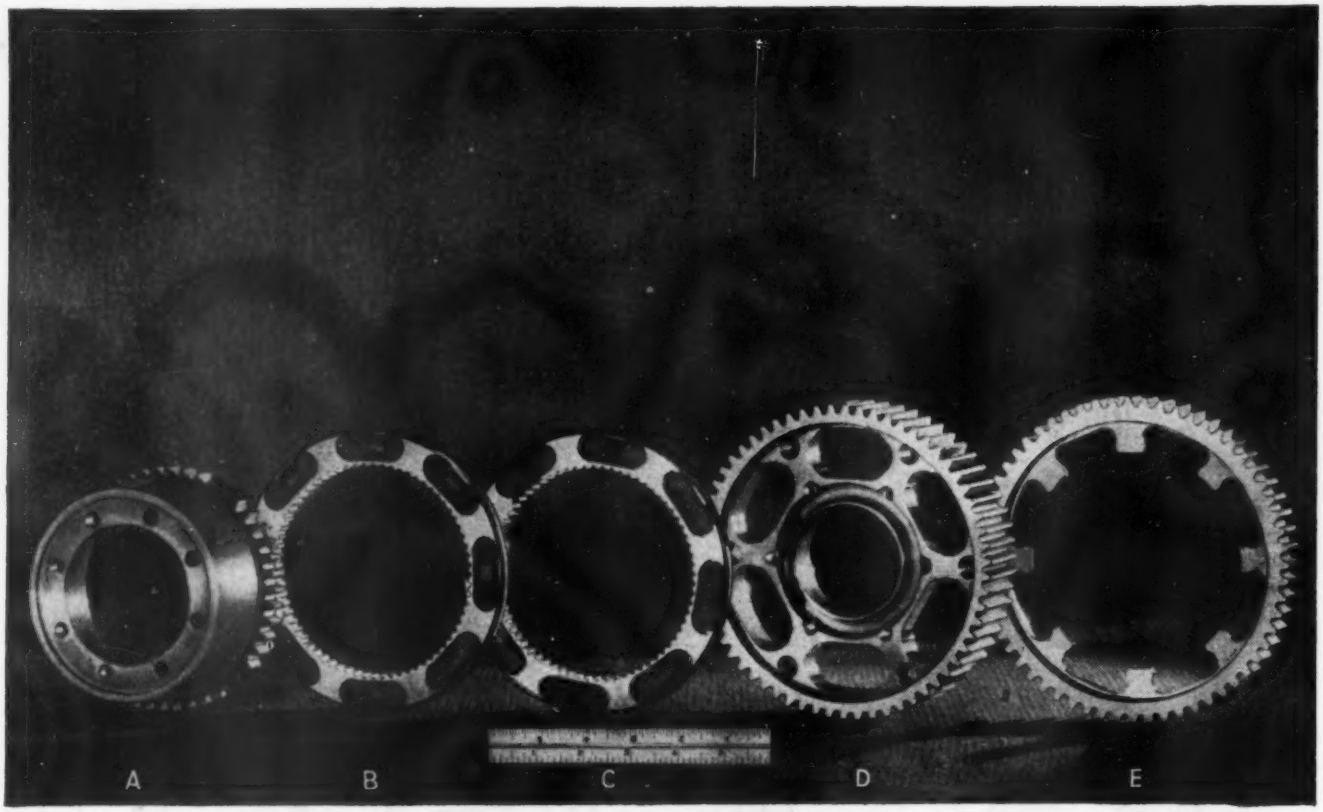
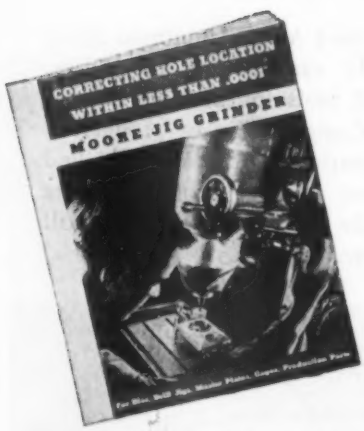


Gear A: Eight holes on circle ground to size and location within ± .0003".
Gears B, C, D, E: Radii at ends of elongated pockets ground to size and location within ± .0003".
Gears B, C: Radii ground to shoulder near bottom of pockets within ± .0005".

PLANETARY PRINCIPLE OF MOORE JIG GRINDER

Displaces Internal

How Each of a Battery of 16 Machines Averages 4 Gears Per Hour With Complete Absence of Scrap

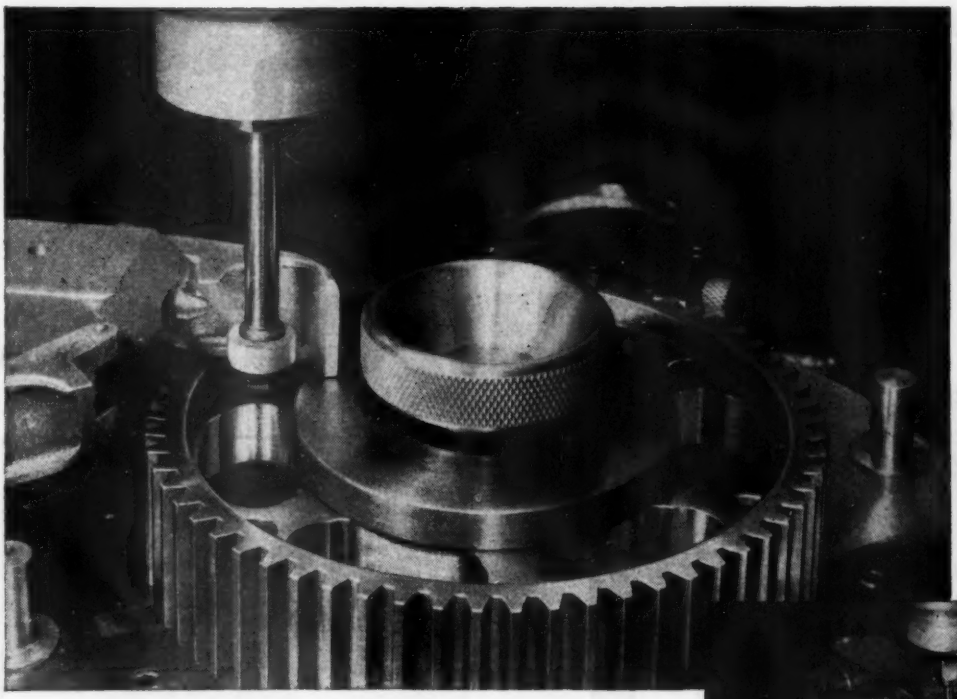


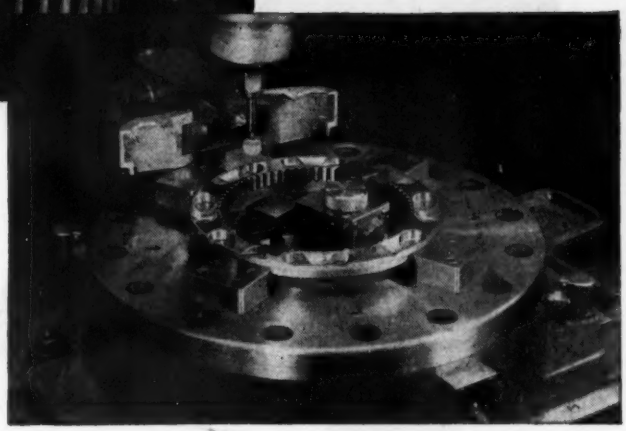
New 28-page catalog describes Moore Jig Grinder's operation and illustrates its application to dies, drill jigs, gage parts, master plates and production parts. Write for free copy.

The Moore Jig Grinder, with its unique planetary principle, grinds the holes and radii in the above gears *more efficiently* than an internal grinder *and at a reduced investment.*

Previously an entire gear was rotated in a heavy, unbalanced indexing fixture on an internal grinder's faceplate. This method proved so slow and cumbersome in the production of vitally needed aircraft engines that an automotive manufacturer* finally solved the problem by replacing internal grinders with Moore Jig Grinders...with these results:

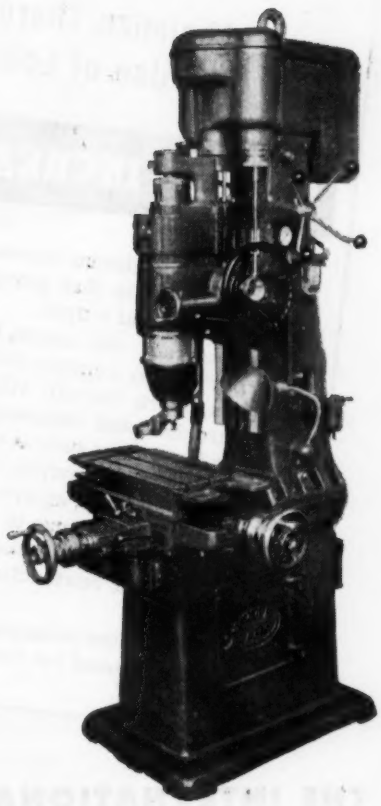
Simple stationary indexing fixtures, providing automatic hole sizing through diamond dressing, were all that was necessary to adapt this precision toolroom machine to mass-production. An average of four gears per hour are being ground on each of a





Two of the fixtures built by Moore for Jig-Grinding the radii and holes. Each fixture is equipped with an adjustable wheel-dressing diamond. A pass of the wheel over the diamond dresses it to the correct diameter, so that the radius is automatically ground to size.

Grinders IN MASS-PRODUCTION



battery of sixteen machines *to closer tolerances and with simpler set-ups ...plus the complete absence of scrap.*

Since installation, the Moore Jig Grinders' performance has so well vindicated the manufacturer's judgment that ten additional machines are being provided for the same purpose.

The only machine of its kind, the Moore Jig Grinder, finish-grinds straight or tapered holes to size and location, corrects hardening distortion and removes decarburized surfaces. It has a capacity to grind holes from .030″ to 4″ and grinding speeds of 14,000 and 50,000 RPM. And it provides .00005″ per inch accuracy of lead screws.

MOORE SPECIAL TOOL CO., INC.
738 UNION AVE., BRIDGEPORT 7, CONN.

**Complete details of this job will be sent upon request.*

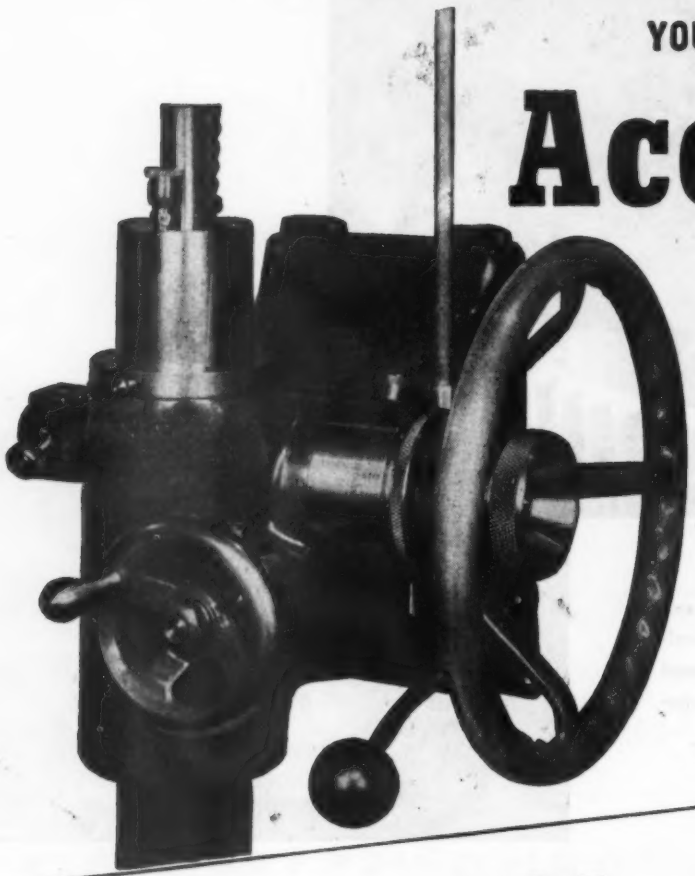
Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND

HOW NICKEL HELPS **Maintain**

YOUR MACHINE TOOL OPERATING

Accuracy...



Minimize Thermal-Induced Error by Use of Low Expansion Alloy

SECURE INCREASED PRODUCTION

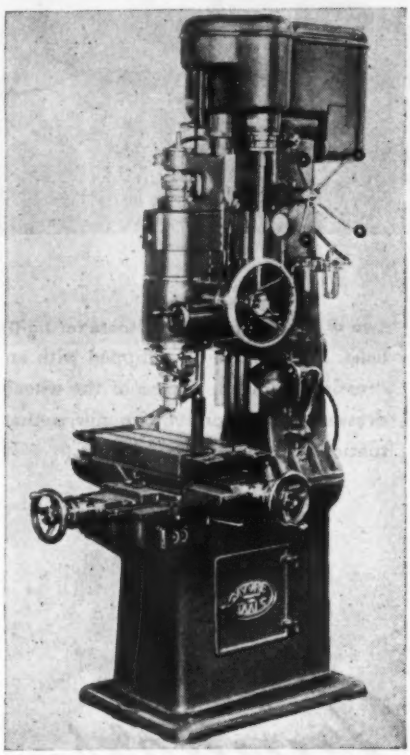
Competitive conditions increase the value of units that provide high accuracy and output.

But accuracy and output fall sharply when temperature changes, even though slight, cause troublesome dimensional changes in castings such as spindle housings. For example, in jig borers and grinders, as much as .0003" to .0005" change in spindle location has been caused by expansion and contraction of housings.

Such deviations reduce output . . . imposing need for warm-up before jobs can be set . . . requiring constant readjustment during operations.

Thermal-induced error can be reduced to a negligible minimum . . . with Type 6 Ni-Resist . . . commonly termed "Invar Iron". Castings of this low expansion alloy, containing 36% Nickel, have proved successful even under very wide temperature changes.

We invite consultation on the use of Nickel Cast Irons and other alloys containing Nickel. Send us details of your problems for our recommendations.



Moore Jig Grinder with Spindle Housing of Low Expansion "Ni-Resist".

Here's what J. R. Moore* says about Type 6 Ni-Resist:

"Since we started using 'Invar Iron' . . . we have found that we have been able to virtually eliminate the warming-up periods previously required to make accurate settings or determine accurate locations. The overall efficiency of these two machines is probably increased by at least 20% and no difficulty on this score has since been encountered by users. This is an important factor, particularly in the use of machines intended to work within tolerances of ten-thousands of an inch."

*Production Manager and Secretary of the Moore Special Tool Company, Inc., Bridgeport, Conn.

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall Street, New York 5, N. Y.*

Send for this NEW BULLETIN

covering standard
and special
TAFT-PEIRCE
Norbide* & Carbide Gages

The complete line of Taft-Peirce Carbide Gages is illustrated and described in this new 4-page publication. Available styles and sizes are listed, and examples shown of the types of special gages which can be produced to order by the Taft-Peirce Small Tool and Gage Division.

If you are interested in reducing your costs by the use of gages made of these wear-resisting materials, simply write for a copy of this bulletin.

*Norbide (Boron Carbide), trademark of Norton Co., reg. U.S. Pat. Off.

The Taft-Peirce Manufacturing Co.
WOONSOCKET, RHODE ISLAND

CM

68 Years of experience really means something

HOISTS

COMET light weight electric hoist. Capacities from ⅛th to 1 ton.

METEOR heavy-duty electric hoist. Capacities from ½ ton and up.

CYCLONE 12 bearing high speed hand hoist. Capacities from ¼th ton and up.

Since 1876 Chisholm-Moore has been providing industry with many types of overhead materials handling equipment. These years of experience combined with "service-thinking" engineering skill are reflected in the operating efficiency, durability, economy and safety features of all CM materials handling equipment.

Hand Chain Hoists, Electric Hoists, Monorail Trolleys, Traveling Cranes, CM Puller (for horizontal pulling) and other CM equipment are fully illustrated and described in Catalog 1944. You'll find the information most helpful. Write us today for a copy.

CHISHOLM-MOORE HOIST CORPORATION

(Affiliated with Columbus-McKinnon Chain Corporation)

GENERAL OFFICES AND FACTORIES: 128 Fremont Ave., TONAWANDA, N.Y.

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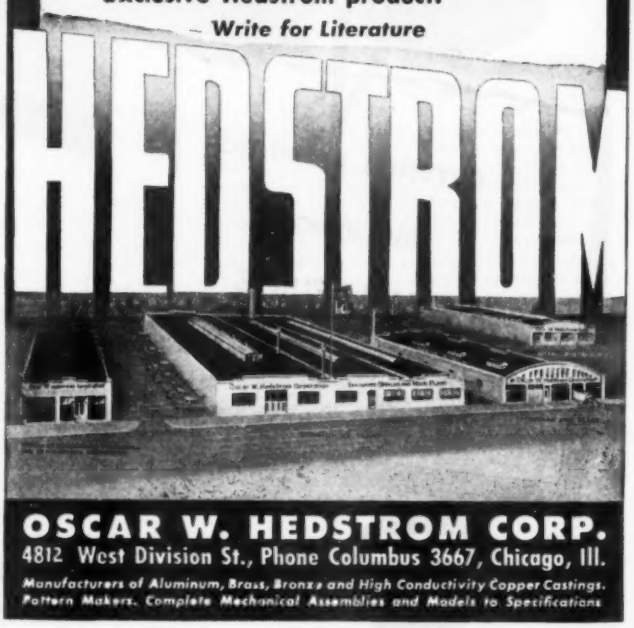
an element of Victory

OH 38

Easily Machinable

An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

Write for Literature



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Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

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DOWN *comes inventory!*

"FACT-POWER" *simplifies inventory control for* READY-POWER COMPANY

In the first six months of operation with Kardex *Visible* Inventory Control. The Ready-Power Co. isolated $7,000 in obsolete parts—reduced their inventory, smoothed their scheduling, planning and production operation.

"We have found the greatest feature of this record is its simplicity of operation." says Mr. W. A. Butner, Vice-President and Manager of Ready-Power Division. "It provides condensed facts on past experience, at a glance it reveals current stock and balance available for future requirements. This accurate data facilitates intelligent decisions in ordering the proper quantities at the proper time."

Recognizing the importance of this inventory record should fire strike, Ready-Power safeguards this vital "Fact-Power" data—gives it the *certified* fire protection afforded by Safe-Kardex Cabinets.

Full details in "STOCK CONTROL FOR THE MANUFACTURER". This valuable study is now available on special loan service from our Systems Research Data File. Get it from our nearest Branch Office.

SYSTEMS DIVISION

REMINGTON RAND

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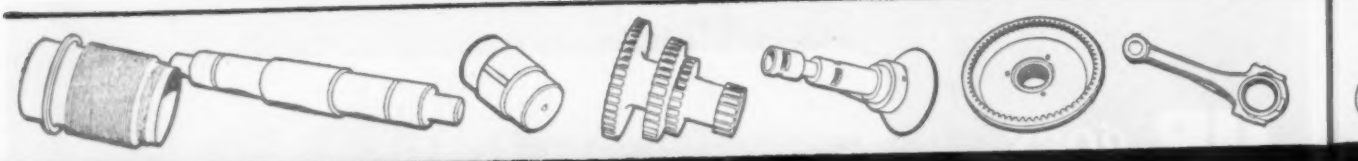

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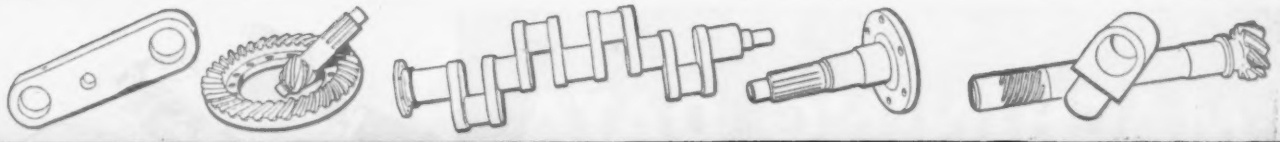
FOR PARTS . . .

- **that must have high surface hardness and wear-resistance**
- **that must retain hardness at elevated temperatures**
- **that require high resistance to fatigue**



STEELS

BARS
BILLETS
SLABS
PLATES
SHEETS
STRIP
In all commercial sizes

WE are in excellent position to furnish the complete line of special alloy steels most suitable for case hardening by nitriding.

These Nitralloy Steels are produced both in our Chicago and Pittsburgh mills. Our metallurgists will gladly discuss their application in terms of your requirements.

(If you are not equipped to handle nitriding in your own plants we will gladly tell you what firms in your vicinity are qualified to do this work for you.)

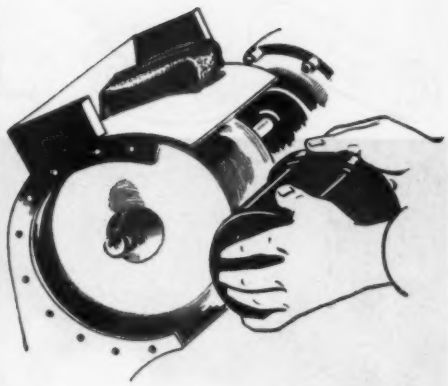
U·S·S CARILLOY ALLOY STEELS

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Co., New York

UNITED STATES STEEL

MACHINING DATA ON PLASTICS

2. POLISHING AND BUFFING



This is the second in a series of messages designed to better your knowledge concerning the machining of phenolics—the most versatile of all plastics . . . the type of plastics which Durez has specialized in producing for more than two decades.

After a phenolic plastic piece is removed from the mold, it is usually ready for use or sale. The surface finish is determined entirely by the finish of the mold. In general, the only requirement is the removal of "flash" or "fins." This is the excess material which appears on that part of the piece where the mold comes together —called the parting line or flash line. In transfer or injection molding that part known as "sprue" or gate has to be removed.

Of course, where drilling, tapping, or machining is necessary to complete a molded piece, these operations precede any final finishing which may be desired. In such cases polishing and/or buffing may be required either to remove tool or sanding marks or to remove handling marks. Sometimes it is desirable to improve the surface luster, or perhaps remove marks of the mold —scratches, pits, or the like—which often result from long-used or under-polished molds.

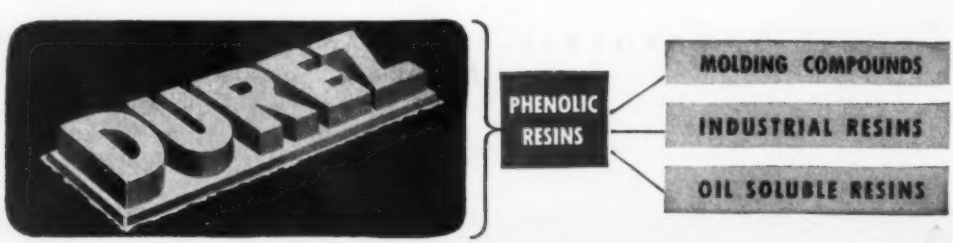
Phenolic pieces may be polished on cloth wheels, using wet pumice or tripoli to remove the marks. This should be followed by a dry buff to increase the polish after this cutting operation. Wax may be used to increase the gloss of molded pieces. Chrome polish may be used to revive the luster where sanding operations have been required. Occasionally tumbling in pumice and then in a polishing compound is resorted to on small parts. This will remove flash and bring back the finish.

The lustrous finish of this DeVilbiss all-plastic vaporizer, is typical of what can be done with versatile Durez phenolic molding compounds.

Great care should be exercised in all buffing or polishing operations on phenolic parts, because the phenolics are not conductors of heat and the frictional heat generated must be taken into account especially on sharp corners where pressure and friction can cause burned surfaces. Fabric wheels of the standard types usually serve for all polishing and buffing needs. Wheels 8 to 14 inches in diameter and 2 to 6 inches wide, operated at 1800 to 2500 R. P. M., serve nearly all reqirements.

Diversity of finishes is one of the many outstanding properties of Durez phenolics. A few others are excellent moldability, dielectric strength, and resistance to heat, moisture, acids and alkalies.

For the past quarter century, Durez technicians have been actively participating in the successful development of many and varied products. The benefits of this unusual experience are available at all times towards furthering your progress in the machining of phenolic plastics. Durez Plastics & Chemicals, Inc., 532 Walck Road, North Tonawanda, N. Y.



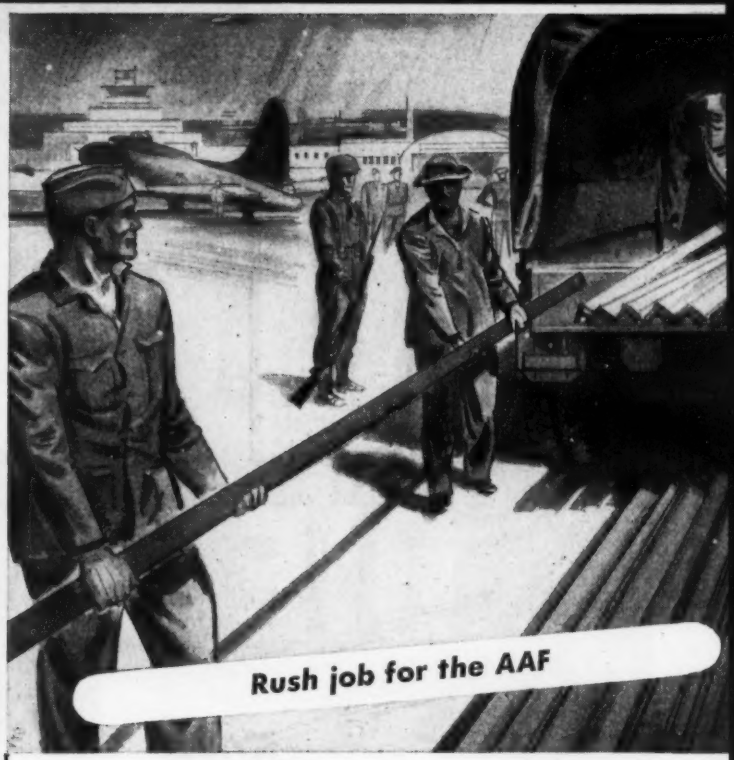
PLASTICS THAT FIT THE JOB

We're on the job...

DAY AND NIGHT!

Repairs speeded at vital iron mine

11:30 one Saturday night, our Twin City manager received an nt call at his home. An alloy steel shaft was needed to repair a kdown that was delaying operations at an important iron mine. ur men got on the job and got the steel ready. The mine sent a k to our warehouse at 4:30 A.M. to pick it up—getting back to the e at 8:00 A.M. Another example of the teamwork that makes our ice to customers so outstanding.



Rush job for the AAF

At noon, one Saturday in September, 1944, a call came to our St. Louis warehouse from an Army Air Field. Could we cut some 18,000 lbs. of steel angles into 20-foot lengths and load them onto an Army truck at 8:00 A.M. Sunday? We could and we did—meeting an important emergency.

NEED STEEL? *Call us...*

UNITED STATES STEEL SUPPLY COMPANY
USS
STEELS
SERVICE

Stocks in our warehouses today are larger and there is a wide variety of steels available for quick shipment. If you need steel, steel products, tools, equipment or machinery, phone, write or wire our nearest warehouse. The chances are that we have what you want, so a call to us may solve your problem—avoid serious delays to vital war production. Our stocks include the National Emergency Alloy Steels which have proved so satisfactory for many applications. Your orders or inquiries will receive careful, courteous attention and immediate action.

UNITED STATES STEEL SUPPLY COMPANY

CHICAGO (90),	1319 Wabansia Ave., P. O. Box MM	BRUnswick 2000
BALTIMORE (3),	Bush & Wicomico Sts., P. O. Box 2036	GILmore 3100
BOSTON (34),	176 Lincoln St., Allston, P. O. Box 42	STAdium 9400
CLEVELAND (14),	1394 E. 39th St.,	HEnderson 5750
MILWAUKEE (1),	4027 West Scott St., P. O. Box 2045	Mitchell 7500
NEWARK (1), N. J.	Foot of Bessemer St., P. O., Box 479	Bigelow 3-5920 REctor 2-6560 • BErgen 3-1614
PITTSBURGH (12),	1281 Reedsdale St., N. S.	CEdar 7780
ST. LOUIS (3),	21st & Gratiot Sts., P. O. Box 27	MAin 5235
TWIN CITY,	2545 University Ave., St. Paul (4), Minn.	NEstor 2821

UNITED STATES STEEL

AUTO-LITE
DIE CASTINGS

Shock Troops PROVE Shock-Proof QUALITY

The die castings that go into jeeps, half-tracs and combat cars must take the gaff.

Uniform die castings with assured strength and stability are provided by Auto-Lite through an advanced casting technique plus "controlled metals." "Controlled metals" result from such practices as spectographic analysis, metallographic studies, physical testing, X-ray inspection and heat treating.

Complete facilities for die casting, trimming, precision machining, plating, painting, cronaking, and anodizing are combined under one roof at Auto-Lite Die Casting Division. These facilities and material control are offered to meet your wartime demands and postwar requirements. For information based on Auto-Lite's wide experience, write:

THE ELECTRIC AUTO-LITE COMPANY
Die Casting Division
WOODSTOCK, ILLINOIS

600 S. Michigan Ave. CHICAGO 5, ILLINOIS
723 New Center Bldg. DETROIT 2, MICHIGAN

BUY WAR BONDS

Oil seal for engine ▶ used in jeeps, half-tracs and combat cars, etc.

Spotlight ▶ bracket—maintains rigidity.

◀ Grip for spotlight.

◀ Speedometer bracket—accurately cast to .002.

Blackout Lamp Door. ▶

◀ Wire terminal housing for voltage regulator.

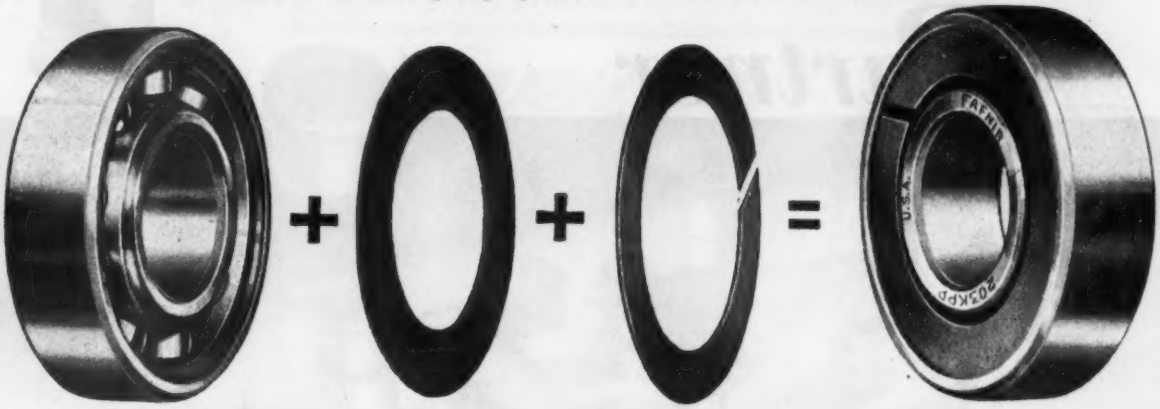
Voltage regulator ▶ —cast accurate to match case.

◀ Voltage regulator case—carries 17 pounds under shock and service required of jeeps.

Tune in
"EVERYTHING FOR THE BOYS" STARRING
DICK HAYMES—EVERY TUESDAY NIGHT—NBC NETWORK

FAFNIR PLYA-SEAL BALL BEARINGS

Performance Proved in Military Equipment • Now Available for General Use



Fafnir Standard Ball Bearing — Flexible Sealing Washer — Split Retaining Ring — FAFNIR PLYA-SEAL BEARING

POSITIVELY SEALED
— SEALS EASILY REMOVED

THE result of five years of development and testing, PLYA-SEAL bearings have proved the most effective, self-protected bearings yet designed. Approved for aircraft by the Army Air Forces and the Bureau of Aeronautics U. S. Navy, Fafnir PLYA-SEALS have been in use successfully for over two and one-half years in aircraft control bearings and operating equipment. Several thousand bearings incorporating the double PLYA-SEAL have completely eliminated former difficulties with metal shielded bearings in textile machines.

Whether you are designing a new product or planning to resume production on an old one, you will find it very much worthwhile to investigate and test Fafnir PLYA-SEAL Bearings. Write for complete descriptive folder. The Fafnir Bearing Company, New Britain, Conn.

PLYA-SEAL takes its place among these other FAFNIR "FIRSTS" . . . Wide Inner Ring Ball Bearing with Self-Locking Collar; Seal and Shield Type Bearings; Compact Super-Precision Spindle Bearings; Compensation Retainers, Aircraft Ball Bearings, Rubber Pillow Blocks . . . and more.

WHAT IS PLYA-SEAL?

A diaphragm-type, contact seal comprised of two members – a flat, flexible sealing washer of synthetic rubber impregnated fabric and a split retaining ring of stainless steel.

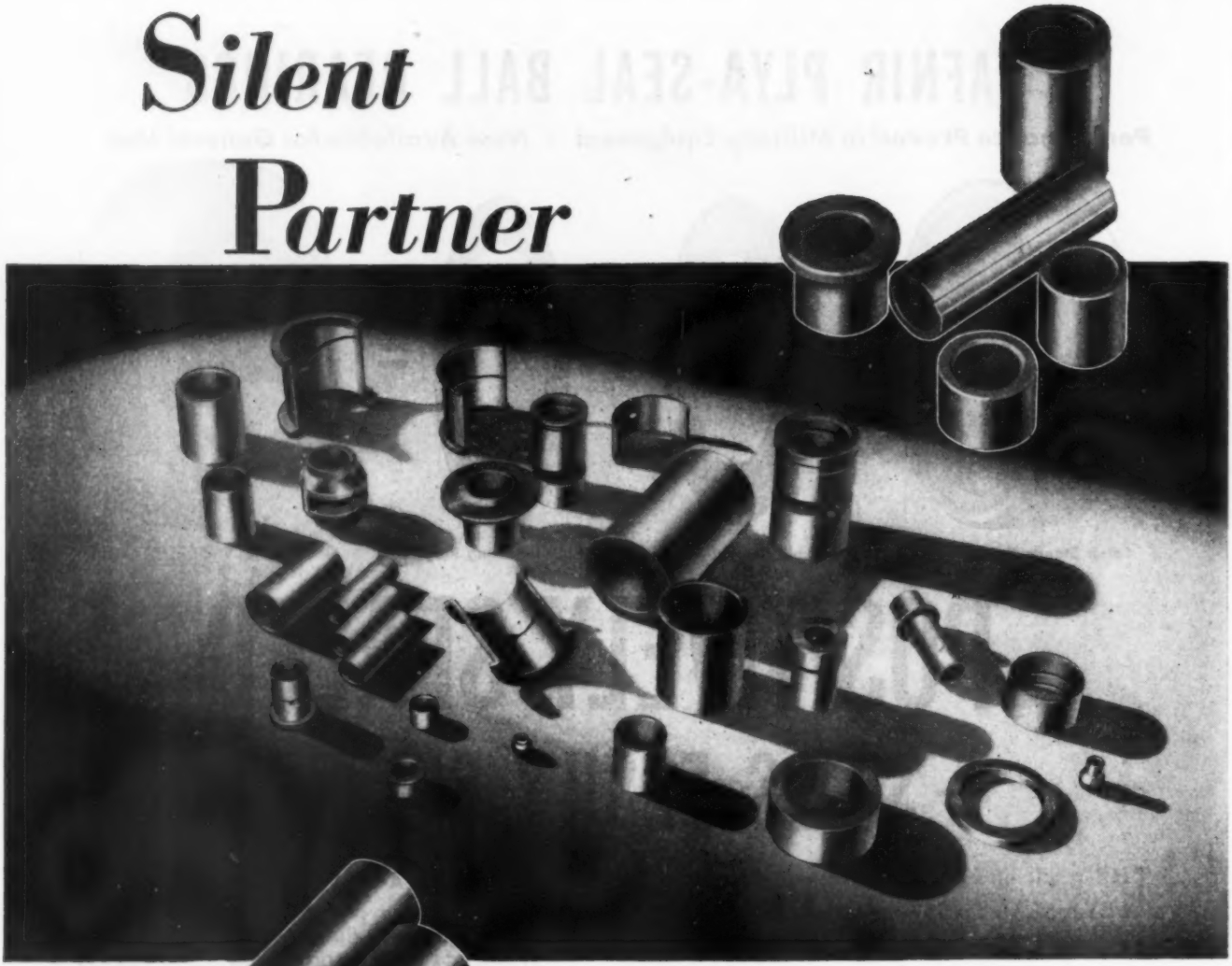
Firmly held in the outer ring, the sealing washer does not rotate with the inner ring but is in contact with a ground groove to form a very effective seal with a minimum of friction.

WHAT ARE PLYA-SEAL'S ADVANTAGES?

1. Assures maximum retention of lubricant, maximum exclusion of dirt and liquids.
2. Causes no distortion of the outer ring or race, nor does it affect the concentricity of either the rings or races.
3. Forms a positive seal with the outer ring while maintaining perfect contact with the inner ring.
4. Non-capillary and impervious to liquids, grease, oil, gasoline, water and a wide variety of solvents. Not affected by heat or cold. Sealing washer does not deteriorate with age.
5. Easily removed and replaced to allow inspection, washing and re-greasing.

FAFNIR
BALL BEARINGS

Silent Partner



of Performance

QUIET operation is a strong selling point for all types of household appliances. One easy way to eliminate noise is to install Johnson Bronze Sleeve Bearings in the motive unit. They are precision made products, guaranteed to deliver the utmost in performance for the longest period of time.

Manufacturers giving thought to their postwar product will do well to consult with Johnson Bronze now. Simply call in a Johnson Engineer. Permit him to review your applications. All of his recommendations will be based on facts, supported by more than thirty-five years exclusive bearing experience. There is a Johnson Engineer—as near as your phone.

JOHNSON BRONZE COMPANY
515 S. MILL ST. NEW CASTLE, PA.

Victory COMES FIRST

All our present production is for Armament

JOHNSON
SLEEVE BEARING HEADQUARTERS
BRONZE

BRANCHES IN 18 INDUSTRIAL CENTERS

MAINTENANCE OF STRUCTURE IS FUNDAMENTAL IN MACHINABILITY.....

A FOOTBALL TEAM TRAINED IN FUNDAMENTALS WILL EVENTUALLY WIN OVER TEAMS RELYING ON RAZZLE DAZZLE PLAYS

How often have you witnessed a football game on an autumn Saturday afternoon between a team relying almost entirely on trick plays, but noticeably weak in blocking and tackling,—the other team definitely schooled and trained in *fundamentals,* relying on good blocking, deadly tackling. The razzle dazzle team gives the spectators some thrills—but the team trained in football fundamentals usually comes through with the winning score.

Wyckoff metallurgists recognize that the continual reproduction of a desired structure is *fundamental* to the maintenance of consistently satisfactory machining production.

Wyckoff will welcome the opportunity of explaining the *fundamentals* of Structure Controlled Annealing.

Write for information.

WYCKOFF STEEL COMPANY

General Offices: **PITTSBURGH 30, PENNA.**

Works: **AMBRIDGE, PENNA.; CHICAGO, ILL.; NEWARK, N. J.; PUTNAM, CONN.**

Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2" . . . Complete Annealing and Heat Treating Facilities.

"Brother, take it from me... it's 100% Easier to Drive 50% More Screws in a Day!"

... that's what users of

AMERICAN PHILLIPS SCREWS

tell users of Slotted Screws

Workers on screw assemblies feel as though they had been freed from a chain gang, when their production chiefs liberate them from slow, exhausting, *high-cost* slotted screw driving . . . up to speedy, easy, *low-cost* American Phillips Screws and 4-winged Phillips power drivers.

For then they find that they can make their jobs amount to something . . . that it's actually far easier to do better work and more of it . . . yet still end their shifts without undue fatigue. Simply because American Phillips Screws drive automatically straight—and because the 4-winged driver can't jump out of the recess.

So management finds that . . . by increasing workers' safety, earning power, and morale . . . there's a fairer return on fixed overhead charges. And *you* will find, when you change to American Phillips Screws, that you get *extra* returns from American's quality-control and American's three-point inspection of head, thread, and point that assures full usable value in every shipment. Whether you use standard or special screws, you'll save 50% over slotted, by changing to American Phillips Screws. Write.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: **589 E. Illinois Street** ***Detroit 2:*** **502 Stephenson Building**

Take a Recess from Slotted-Screw Costs and Troubles

...the Tapered, Engineered Recess of:

AMERICAN PHILLIPS *Screws*

Put the Screws on the Japs . . . BUY BONDS!

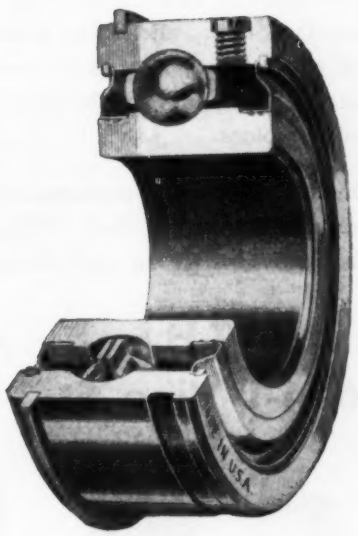
NATURE *proudes*

...EXTRA GREASE CAPACITY FOR PROTECTION

But — among "Self-Protected" and "Sealed" bearings it's the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING that provides that extra—more than double—grease capacity so vital to long life, low maintenance and minimum attention.

• • •

There are many other distinctive — and equally valuable — features, in the "CARTRIDGE" Bearing.

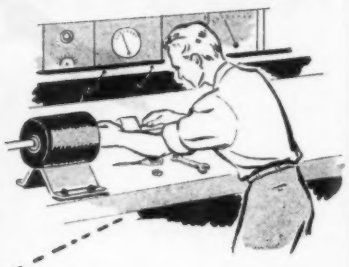


Write for full details to our nearest office. Or,—better yet—ask them to send one of our engineers to discuss your bearing problem—in strict confidence, of course.

NORMA-HOFFMANN BEARINGS CORP'N. STAMFORD, CONN. *Founded* 1911

Field Offices: NEW YORK • CHICAGO • CLEVELAND • CINCINNATI • PITTSBURGH • DETROIT • LOS ANGELES • SAN FRANCISCO • SEATTLE, WASH.

SPECIALIST - OF SPECIAL TORQUE MOTORS



Separately Ventilated Blower Motor . . . for cable reels . . . or clutches where power must stay on continually. Motor-driven fan keeps large motor cool regardless of continuous stall.

There are literally thousands of Welco "Custom-built" motors in operation. Each one of these special motors is delivering dependable, low-cost service day in and day out . . . and doing it because it was built by the specialist of special motors, The B. A. Wesche Electric Company, for 35 years builder of "Custom-built" motors.

One of the most outstanding features of Welco Torque Motors is their "Uni-frame" construction. This provides for an easy change from A.C. to D.C. power or vice versa. However, only Welco Motors have this vitally important interchangeability.

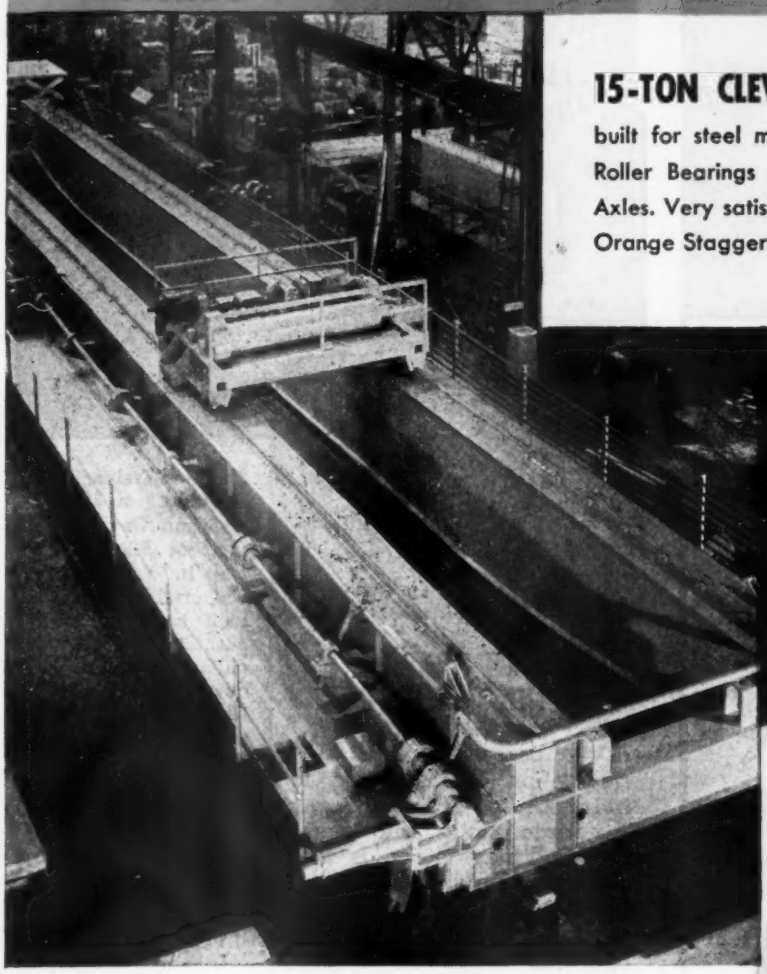
Both the A.C. and D.C. Welco Torque Motors are built to exert torque up to 4000 inch pounds—just another development resulting from specialization in the difficult, the out-of-the-ordinary applications of torque motors.

Write to Welco regarding your special powering problem. There is no machine powering problem too difficult for our engineers to solve.

THE B. A. WESCHE ELECTRIC CO.

1624-1 Vine St. Cincinnati 10, Ohio

DESIGNED FOR HEAVY LOADS!

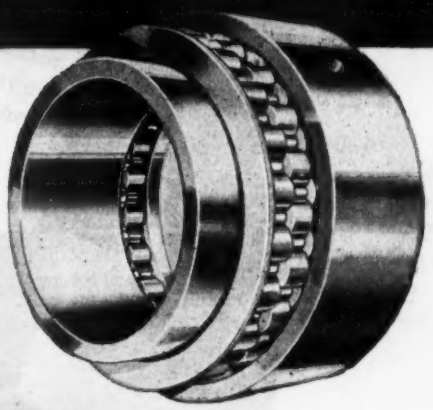


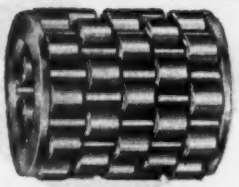
15-TON CLEVELAND OVERHEAD CRANE

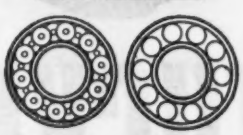
built for steel mill service, uses Orange Staggered Roller Bearings on Hoist Shaft and Bridge Wheel Axles. Very satisfactory service is reported wherever Orange Staggered Roller Bearings are used.

ORANGE

"STAGGERED" ROLLER BEARINGS







The staggered roller design brings maximum roller surfaces in contact with the load, as shown by end views of an Orange Staggered Roller Bearing and a conventional roller or ball bearing.

Wherever bearings of extreme ruggedness and load carrying capacity are needed in your equipment—be sure to study the capacities of Orange Staggered Roller Bearings when designing. You'll find that you can design to smaller size, because Orange Staggered Roller Bearings do the work of larger conventional roller bearings. Or, use them equal size for higher load carrying, safety margin and life hours expectancy.

The exclusive design of Orange Staggered Roller Bearings (shown at the right) shows how the load is distributed over many short rolls instead of a few full length rolls. Maximum supporting area is obtained in minimum space. Skewing of rollers is minimized due to the ease of alignment and adjustment in the raceway load area. Even running is assured.

Orange Staggered Roller Bearings are made in a full range of standard, **interchangeable** sizes. Write for Engineering Data Book giving details of design, sizes, capacities, application data, etc.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Staggered Roller Bearing Data Book

Name..... Title.....

Company.....

Address.....

City..... State.....

ORANGE ROLLER BEARING CO., INC.

554 Main Street, Orange, N. J.

USE HEADED AND THREADED FASTENERS FOR ECONOMY AND RELIABILITY

BRASS
BOLTS · NUTS
STUDS

Brass and bronze, all types—every non-ferrous metal—available in every standard dimension or to your specifications.

Better Bolts of Iron, Steel, Brass and Other Metals Since 1882.

PAWTUCKET

"THE BOLT MAN"

MANUFACTURING COMPANY

327 Pine Street • Pawtucket, R. I.

THE PLACE TO SOLVE YOUR BOLT PROBLEMS

HEAVEN AND EARTH
Rotate on a CURTIS UNIVERSAL JOINT

The Link Trainer is a product of Link Aviation Devices, Inc., of Binghamton, N. Y. Curtis Universal Joints are built to meet the exacting standards of the Aircraft Industry and to equal Class I Specifications of the Army Air Forces.

... to the men in a LINK TRAINER

A vital part in the Link Crew Navigation Trainer used to train United States Army Air Force pilots, radio operators and navigators, is the Curtis Universal Joint which supports the fuselage on the top of the 18-foot tower, beneath the celestial dome.

This Curtis Universal Joint mounting leaves the fuselage free to bank, pitch and turn within the angular limits normal to instrument flying. It is a unique application of the Curtis Universal Joint principle which is the answer to transmitting out-of-line motion or power, or rotating shafting around corners.

In every phase of their training, and right up to the time these men are in actual combat, they will find Curtis Universal Joints used in almost any plane they fly—in engine controls, retractable landing gear, control flaps and auxiliary power controls.

Also a great many machine tools which build the planes use Curtis Universal Joints in hundreds of applications where a precision product of proven strength and long-wearing quality is required. Let Curtis Engineers help you in your universal joint problems—if a "Standard" Curtis unit, either single or double, will not meet your needs, we can design a joint that will.

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

BOSTON GEAR WORKS, NO. QUINCY, MASS., SOLE DISTRIBUTORS

66% Saved on Production Cost Using *Speed Treat Plate* and Simple Heat-Treatment!

A large plastics molding firm replaced high alloy steel with *Speed Treat* medium high carbon hot rolled open hearth steel plate for the compression mold die shown.

Costing *less than a third* of the steel it replaced, *Speed Treat Steel* proved easier to machine and has turned out over one-half million molded parts with no appreciable wear and no signs of fatigue or breakage in the inside walls of the die which are only .350" thick. In operation, a pressure of 60-tons is exerted on the mold.

Size and weight of the mold were also reduced—an important factor since it is handled by women.

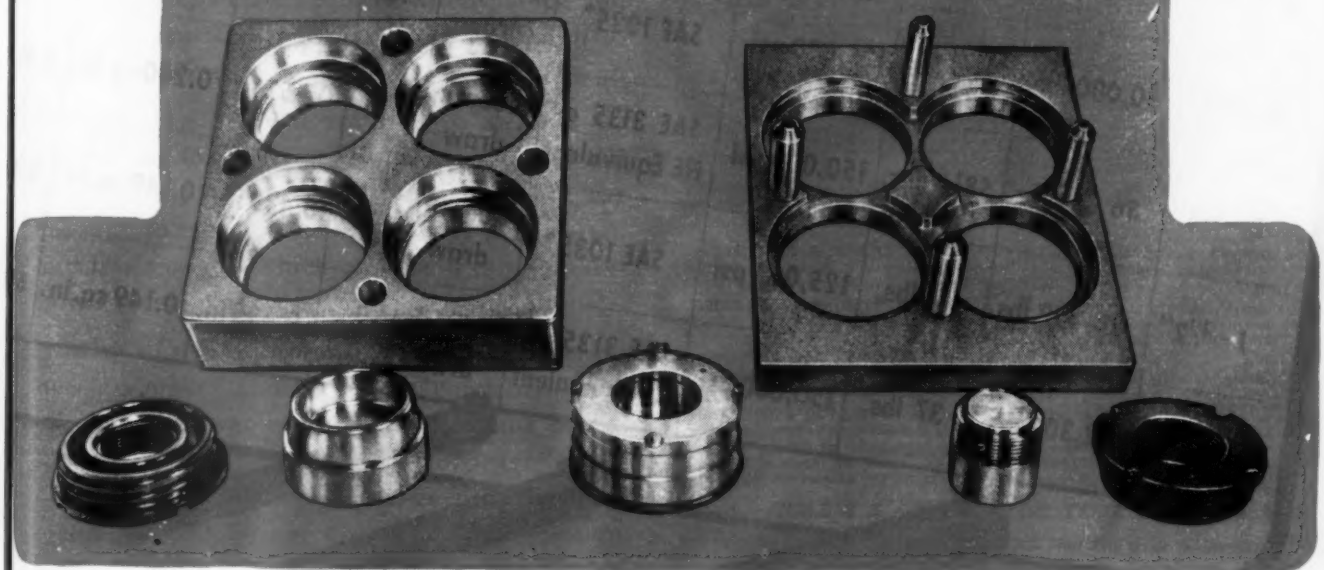
A uniform case $\frac{1}{16}$" deep was developed by pack carburizing. Starting with a carbon content of 0.49%, drillings showed the case had an average carbon content of 1%, varying from 1.13% on the surface down to .95% at a depth of 1/16".

After carburizing, hardening was accomplished by heating in controlled atmosphere to 1500° F., followed by an oil quench. A test showed a surface hardness of 62 Rockwell "C" had been developed.

SPEED TREAT Plate Provides.....

- Better Finish
- Lower Machining and Tooling Cost
- Ideal Response to Heat Treatment
- Negligible Heat Treat Distortion
- Reduced Weight
- As Much As 66% Lower Material Cost
- Savings in Production Time
- Lowest Ultimate Cost

The high surface hardness, exceptional tensional strength and body toughness so readily produced with the simple heat treating procedure outlined renders this unusual steel practical for use where high carbon steels and other costlier steels were formerly thought necessary. The economical advantages of *Speed Treat* warrant its consideration for your postwar dies, shoes and molds; wear, surface and bolster plates; gears and sprockets, machine ways and numerous other parts, many of which are pictured in Catalog 1243, sent on request.



W. J. HOLLIDAY & CO.
Speed Case-Speed Treat Plate Division
Hammond, Indiana
"Established 1856"
PLANTS: HAMMOND AND INDIANAPOLIS, INDIANA

OBTAINABLE AFTER DEC. 1ST
Peninsular Steel Co., 1030-40 McDougall Ave., Detroit.
Earle M. Jorgensen Co., 5311 Clinton Drive, Houston.
10510 So. Alameda St., Los Angeles 54, Calif.
1657 22nd St., Oakland 7, Calif.
Grammer, Dempsey & Hudson, Inc., Newark, New Jersey

Quality Controlled Speed Case and Speed Treat Steel Is Available In All Common Plate Sizes from these Distributors

Beals, McCarthy & Rogers, Inc.
Buffalo, New York

The Burger Iron Company
Akron, Ohio

Brown-Wales Company
493 C. Street, Boston, Mass.

Horace T. Potts Company
East Erie Ave. & D St., Philadelphia, Pa.

Peckover's Limited, 77 Front Street, E., Toronto, Ont., Canada

Use this table of values

Diameter of Bolt	Actual breaking load	Weight per 100 bolts	Ultimate tensile strength	Material	Heat treatment	No. of threads per in.	Root diameter	Area at root diameter	Length under head
A—3/4"	26,300 lbs.	85 lbs.	75,000 psi	SAE 1020	None	16	0.669 in.	0.351 sq.in.	6 in.
B—3/4"	43,900 lbs.	85 lbs.	125,000 psi	SAE 1035*	Quench, draw	16	0.669 in.	0.351 sq.in.	6 in.
C—3/4"	52,600 lbs.	85 lbs.	150,000 psi	SAE 3135 or NE Equivalent	Quench, draw	16	0.669 in.	0.351 sq.in.	6 in.
D—5/8"	30,000 lbs.	58 1/2 lbs.	125,000 psi	SAE 1035*	Quench, draw	18	0.553 in.	0.240 sq.in.	6 in.
E—5/8"	36,000 lbs.	58 1/2 lbs.	150,000 psi	SAE 3135 or NE Equivalent	Quench, draw	18	0.553 in.	0.240 sq.in.	6 in.
F—1/2"	18,600 lbs.	37 lbs.	125,000 psi	SAE 1035*	Quench, draw	20	0.435 in.	0.149 sq.in.	6
G—1/2"	22,300 lbs.	37 lbs.	150,000 psi	SAE 3135 or NE Equivalent	Quench, draw	20	0.435 in.	0.149 sq.in.	6

*A.I.S.I. C-1038

● Want to save some dead-weight in your assemblies? Want to design to drill the smallest holes and use the smallest bolts you can? Want to get twice as many bolts per car load? If you say "yes"—then here's one way you can do it.

Just study this table of physicals above. Note how physicals are related as to material and dimensions and heat treatment of bolts. If you considered using a 3/4-inch x 6-inch bolt of SAE 1020 steel—note how you can get the same strength in a bolt of much less weight.

IN DETERMINING WHAT SIZES OF BOLTS YOU NEED IN APPLICATIONS WHERE WEIGHT IS IMPORTANT!

Quite obviously, if you can use a smaller bolt than you had planned for, you can save some critical steel and you can drill smaller holes.

If you use a smaller bolt, you can use a smaller nut, and thus you subtract more dead-weight from your assembly.

But those are not all the advantages achieved by your use of a smaller bolt, for just by using it you set in motion a train of circumstances favorable to our war production effort.

For instance, we are required to buy, stock and consume *less than half as much raw material* to make the ½-inch bolt as for the ¾-inch bolt.

By requiring *less material,* we free material *we did not use* to other manufacturers. And by the same token, we need less railroad freight car capacity to get the smaller quantity of material, and less space in which to store it in our warehouse prior to manufacture.

Add up all these conditions and intelligent engineering makes another direct contribution to winning this war in addition to all the others already made in so many directions. Intelligent engineering avoids allowance for the "ignorance factor"—which in our product is the specification of a bolt much larger than is actually necessary to do the job.

Lamson bolt engineers will gladly help you avoid making any allowance for an "ignorance factor" —will help you select the right bolt you need for any given job—and then make it right for you in every detail in any quantity you need—*now, and after the war is ended.*

THE LAMSON & SESSIONS COMPANY, General Offices, Cleveland, O.

"BOLTS, NUTS & SCREWS"—1944 REVISION, Cloth bound, Limited edition, 180 pages of technical, practical information. Sent prepaid for *$1.00—cash or check must accompany your order.*

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FEATURES

1—Hinged armature operating magnet
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3—Valve parts removable without any piping disturbance
4—Bronze valve body
5—Nitralloy valve plunger
6—Air leakage cannot cause pressure build-up in "off" cylinder
7—Continuous duty operating coil
8—Pipe Connections available in bottom or through the side.

★ "3C" Bulletin 5740 Magnet Operated Valves are designed for use on air operated welders, tools, etc.

The hinged armature magnet has very little movement, and a minimum of pounding. It is a slightly modified standard "3C" magnet which has been used for years as a heavy duty contactor operator.

This sturdy valve is designed to give 400 operations per minute. Ample size of bronze stationary valve body and nitralloy moving plunger provide long life with little wear.

For complete details ask for Bulletin 5740

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You don't really know Brass
until you've worked with it

Remember *your* introduction to Brass? As a boy perhaps, in a manual training class . . . or possibly on the bench of your home workshop. Wherever it was, you realized then that the yellow metal was not only royal in appearance, but that it was a *workable* metal, too.

It seems that Brass was especially made to be machined and worked and formed into so many useful things that people need—thanks to copper-alloy metallurgy that has developed a variety of Brasses with properties that manufacturers find so indispensable: Brasses that can be worked hot or cold, that can be forged, rolled, spun, stamped, pressed, coined, upset or drawn; Leaded Brasses that machine at top spindle speeds . . . ductile Brasses that could be formed or shaped with the pressure of your fingers . . . or hard spring Brasses that can be stressed through millions of cycles without danger of failure by fatigue.

Brass, and a host of other copper alloys, are needed elsewhere now. But with peace

(continued on next page)

ANACONDA

Anaconda Copper & Copper Alloys

Planning for Postwar Markets?

weigh carefully the advantages of Copper, Brass and Bronze

(continued from preceding page)

these metals will return, presenting both an opportunity and a challenge . . . the opportunity to build more serviceable, longer-lasting products for our postwar needs . . . and the challenge to manufacture them at low cost—to be sold competitively, and at a profit.

When redesigning or retooling for these postwar products, take advantage of the manufacturing economies that Copper, Brass, Bronze and Nickel Silver have to offer. These strong, tough, workable metals make possible increased life for punches, dies and forming tools on press work; longer runs and less down-time for tool regrinding on screw machines; greater uniformity of parts; low-cost brazed, soldered or welded assemblies; and a non-rust base for enameled, lacquered or plated finishes.

The American Brass Company produces Anaconda Copper, Brass, Bronze, Nickel Silver and special Copper Alloys in practically all commercial forms—plates, sheets, strips, wire, rod and tubes; special extruded, rolled and drawn shapes; hot pressed forgings and pressure die castings. Our Technical Department will assist you in every way possible to determine the "one best metal" and its most practical form for the job you have in mind.

45153

THE AMERICAN BRASS COMPANY

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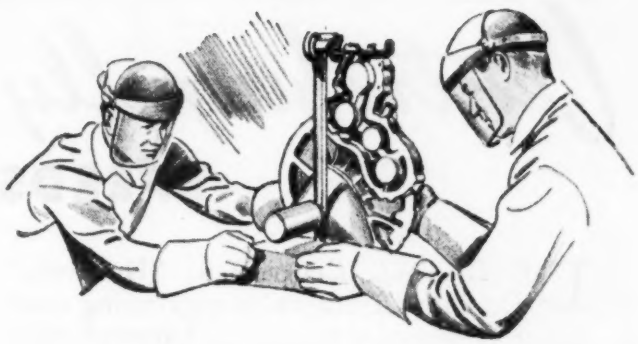
ANACONDA

Anaconda Copper & Copper Alloys

Production men who know magnesium know it is easy to work



Through good shop practice they speed production of new lightweight products

Go to the men in the shops . . . the production men who work with magnesium . . . if you want the real down-to-earth story of its unusual machinability and exceptional ease in working.

They will tell you how magnesium—the lightest of all structural metals—saves time and labor and tools. They will describe its easy sawing, with band and circular saws and also hand and power hack saws, permitting larger cuts per tooth than other structural metals.

And these production men will tell you, too, that magnesium is worked faster and easier than most metals by hand tools—such as chipping tools, drills, burrs, chisels, planes, portable milling cutters.

Shop techniques have, in fact, been developed for all common fabrication methods to speed the output of new products of lightweight magnesium.

Dow men thoroughly familiar with these operations are on call to consult with you at all times.

DOWMETAL *magnesium*

MAGNESIUM DIVISION, THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

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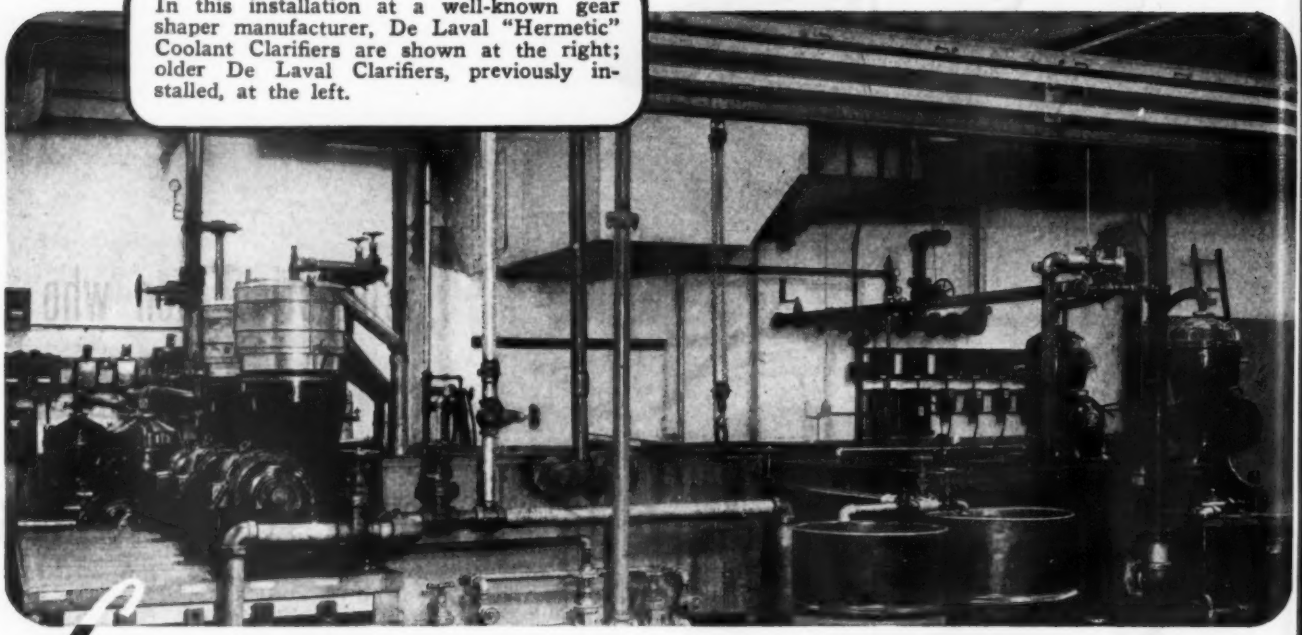
THE METAL OF MOTION



In this installation at a well-known gear shaper manufacturer, De Laval "Hermetic" Coolant Clarifiers are shown at the right; older De Laval Clarifiers, previously installed, at the left.

Centrifugally CLEANED COOLANT SPEEDS GRINDER OUTPUT. . . .

DE LAVAL Centrifugal "Hermetic" Coolant Clarifiers keep grinding coolant so completely free from harmful abrasive and metallic sediment that it is possible to grind to closer limits with less likelihood of distorting the work. Thus, not only are finishes improved, but the time required for hand-finishing processes can be reduced.

De Laval "Hermetic" Coolant Clarifiers eliminate at source the trouble that results from stray abrasive grains or steel particles scratching the work during finish grinding, honing or lapping operations. There are other benefits of using De Laval-clarified coolant: wheel life is prolonged, softer wheels can be used, and the life of both oil and aqueous coolants is greatly increased, to mention just a few.

De Laval Clarifiers and Oil Purifiers present many other opportunities to conserve valuable liquids by continuous removal of impurities. The purification of cutting oils, for example, and of test oils, hydraulic oils and other factory oils are other steps which almost always lead to lower production costs.

● Write for additional details.

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DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
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Uniform, Synchronous Speed at Every Station

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Electric motors driving the intricate mechanisms of machines that transmit and record messages verbatim must have identical operating characteristics at every station. Since standard "off-the-shelf" motors cannot meet the strict performance requirements, such as uniform, synchronous speed, quietness, load cycles, etc., the solution is a special motor designed to exactly meet the particular operating conditions.

For over 50 years Holtzer-Cabot has designed and built special motors to fit the application. Many machines such as teletype machines, and other sending and receiving equipment are Holtzer-Cabot powered.

Although, today, all of our plant facilities are being utilized for building special fractional H.P. motors for military use, our motor development engineers will gladly discuss your post-war motor requirements with you. No obligation of course.

SPECIAL MOTORS DESIGNED TO FIT THE APPLICATION

HOLTZER-CABOT

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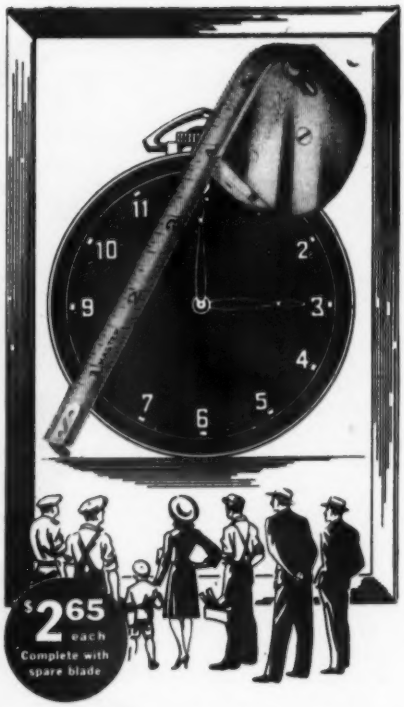

Less Measuring Time with this *NEW* STEEL TAPE RULE

The already famous Master Streamline rule has been redesigned and simplified. Because of its simplification, accurate measuring can be done more speedily—a feature especially valuable to engineers, carpenters and other craftsmen. With this versatile rule, it's easy—even from awkward positions—to make every type of precision measurement.

This simplification in design has enabled Master to actually improve the already accepted quality of materials used in the Streamline. Some of the new features include longer tip for more accurate "reach" measurements; less frictional wear on the blade and smoother operation; larger and more secure braking surface to hold dimension; graduations more visible for making inside measurement readings; simpler construction for oiling, cleaning and inserting new blade; still priced at $2.65 complete with spare blade.

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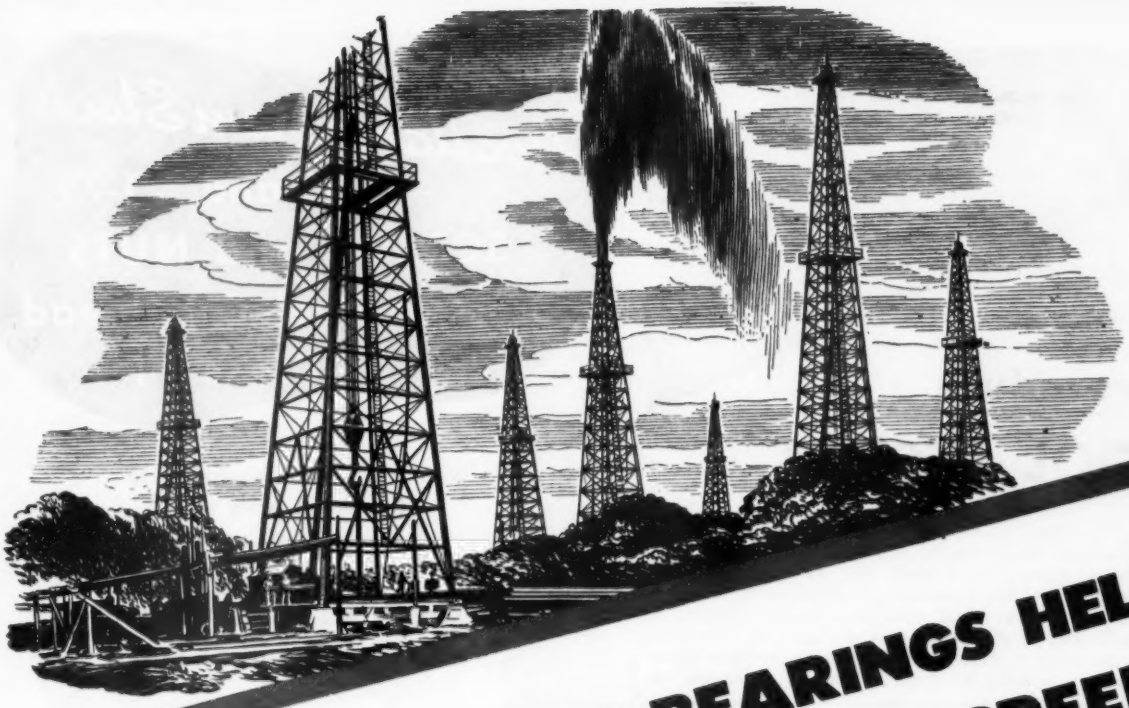
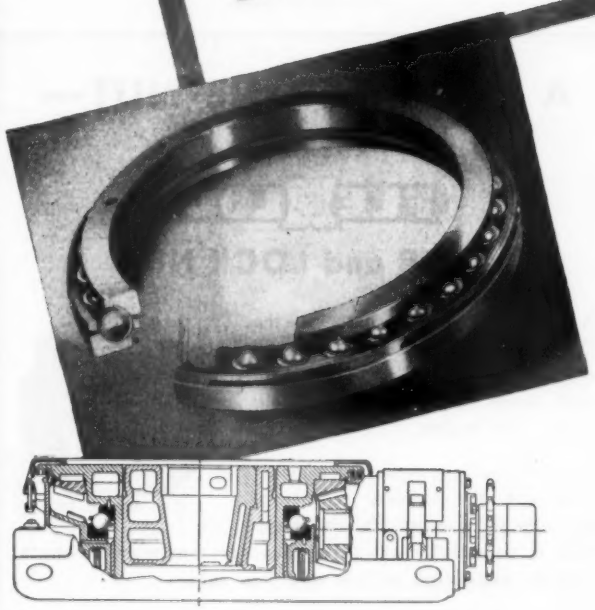


TORRINGTON BEARINGS HELP INCREASE DRILLING SPEEDS



Torrington Angular Contact Bearing designed for rotary tables which carry the load of the drilling "string" in drilling oil wells.

Increasing demands for faster oil production call for equipment that can take it. To increase service life and minimize maintenance in the rotary tables that control oil well drilling speeds, engineers specify the use of Torrington Angular Contact Bearings. Especially designed to carry both the radial and thrust loads imposed by high speed drilling, these modern anti-friction bearings are rigidly controlled in the hardening and grinding process to insure utmost precision and equalize load distribution under all service conditions.

Solving new or unusual bearing problems of the oil, steel, paper, machine tool and other specialized applications is all part of the day's work for the engineers of Torrington's Bantam Bearings Division. Profit by their diversified knowledge and experience by specifying Torrington Bearings when you order equipment.

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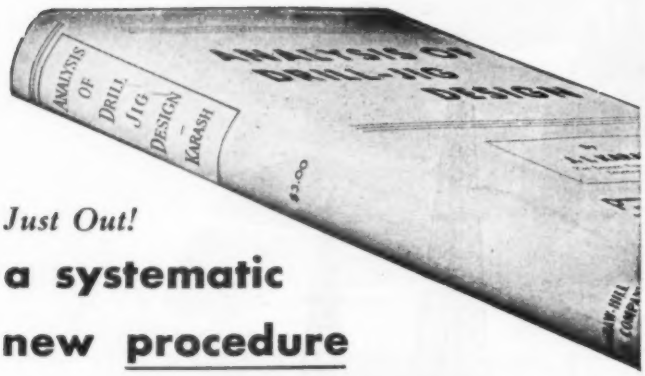

Just Out!

a systematic new procedure

for TOOL DESIGN

The first book of its kind — an *analytical* study of the mental processes and decisions that actually constitute the most important part of design work. Using drill jigs as a specific case study, the book outlines fundamental principles and methods that apply in varied degree to all tool designing problems. It shows plainly each step in the process of design, how the steps relate to each other, and what is needed to best perform them. It establishes for you a basic efficient procedure, applicable to all types of tool design, that you can easily use to save valuable time and improve the practical quality of your work.

A systematic procedure of tool design that makes easier and more productive the mental steps in producing the best tool for the job.

ANALYSIS of DRILL JIG DESIGN

By J. I. KARASH

Plant Engineer, Reliance Electric & Engineering Co.

326 pages, 5½ x 8½, 243 illustrations, $3.00

CONTENTS

1. Outline of Design Practice
2. Gathering Information
3. Analysis of Drilling Operations
4. Division-of-work Decision
5. Machine Decision
6. Principles of Locating
7. Clamping
8. Secondary-operation Jig Features
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11. Principles of Interchangeability
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This book fully demonstrates a new concept of tool design, so analyzing the mental processes of the work and setting up a definite, systematic procedure, that a workable design, of high productive efficiency, may be largely assured before the drafting board is approached.

The book shows how to:—

—eliminate unnecessary steps

—meet shop and production requirements most completely

—gather the information necessary in making decisions

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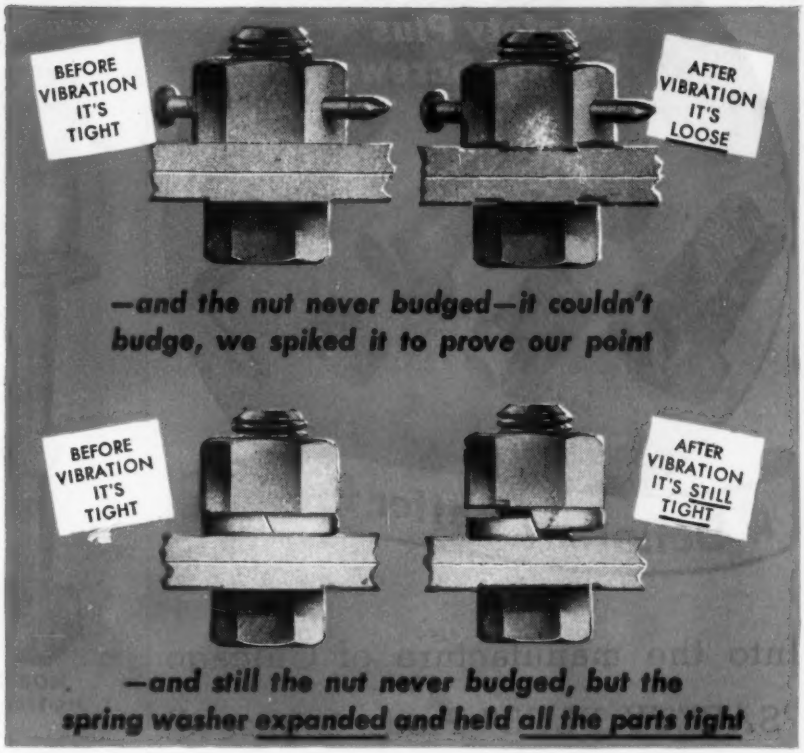
So whether you use a regular standard nut or one of the many fixed or lock-nuts you must use a powerful spring washer. The spring expands and compensates for later inevitable wear. No device except a long-range spring washer can expand and do this job that is so essential to bolted security.


BEFORE VIBRATION IT'S TIGHT
AFTER VIBRATION IT'S LOOSE
—and the nut never budged—it couldn't budge, we spiked it to prove our point
BEFORE VIBRATION IT'S TIGHT
AFTER VIBRATION IT'S STILL TIGHT
—and still the nut never budged, but the spring washer expanded and held all the parts tight

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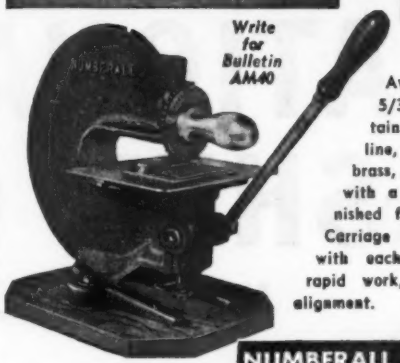

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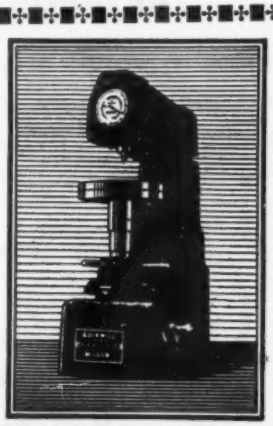

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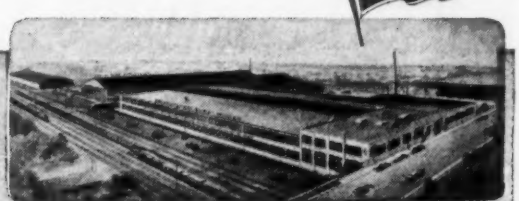
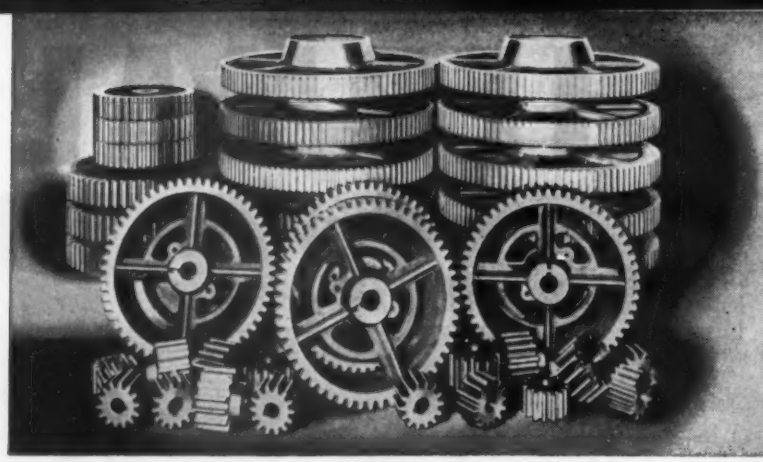


Industrial Gears and Speed Reducers
LimiTorque Valve Controls



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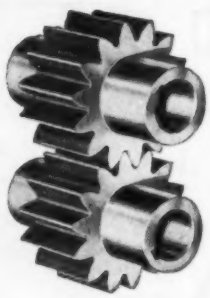

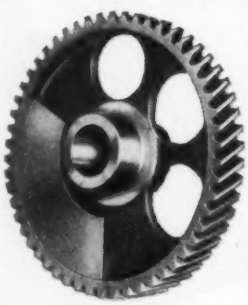

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Of particular importance is the fact that Cincinnati Gears are made to fit your particular requirements . . . from your specifications. In planning your postwar product you'll find it to your advantage to consult the Cincinnati Gear Company. We will be glad to work with you.

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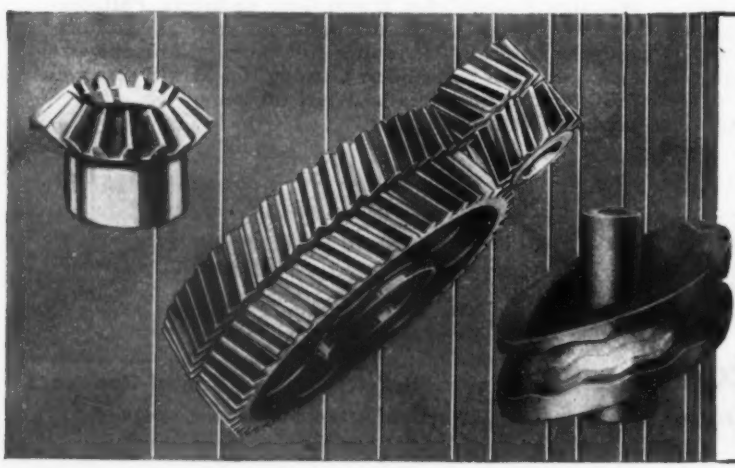
Produced under License Issued by John Milton Luers Patents Inc.



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GEARS of every description cut to order
GEAR, CAM and THREAD grinding
AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

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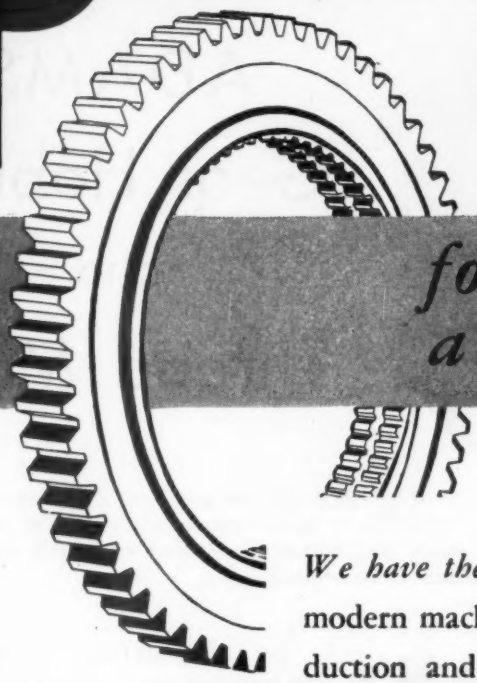
PERKINS GEARS

for close tolerances and high finish



We have the facilities: — A plant equipped with all modern machine tools necessary for the quantity production and prompt delivery of precision gears to customers' specifications.

We have the background: — Many years' experience in producing gears for leading manufacturers now in war work, who previously were engaged in the manufacture of such products as washing machines, coal stokers, precision instruments, business machines, hoists and pumps, machine tools, portable tools, etc., etc.

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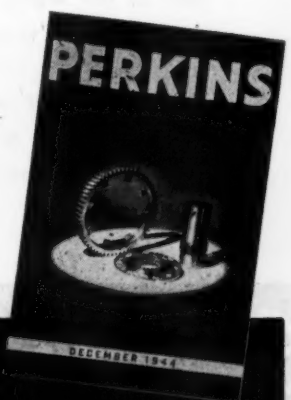
"Perkins" is the name of the house-organ we publish monthly; it may be of interest to you. Write us if you care to receive it. Your good will covers the price of subscription.



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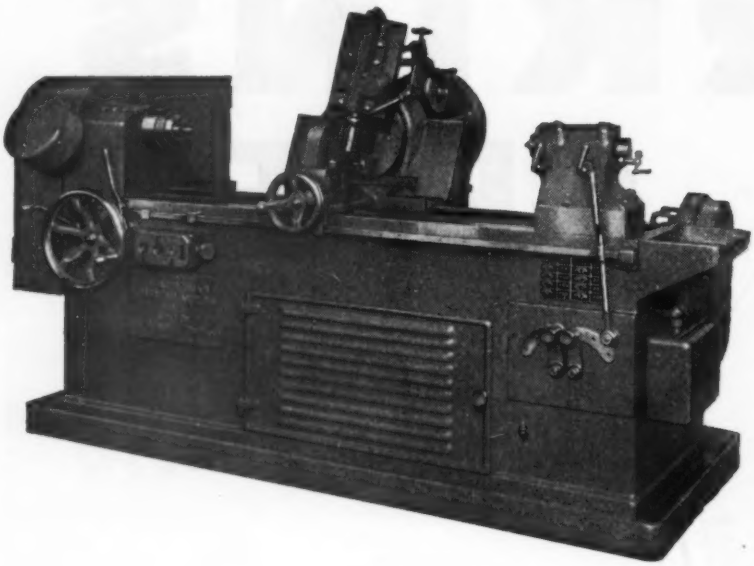

The ADAMS Gear Hobber and Thread Miller

The Adams Manufacturing Hobber is available when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the purchase of equipment for these operations only.

Here is a machine that combines precision with versatility. It hobs multiple splined shafts, spur gears and helical gears, and it will mill worm and screw threads.

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1883 — Our 62nd Year — 1945

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SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

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New Design
New Features
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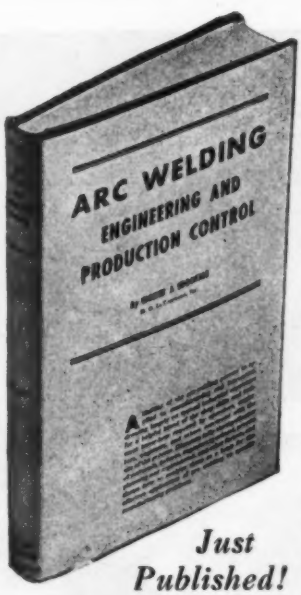

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—Jigs and Fixtures for Arc-Welded Mass Production

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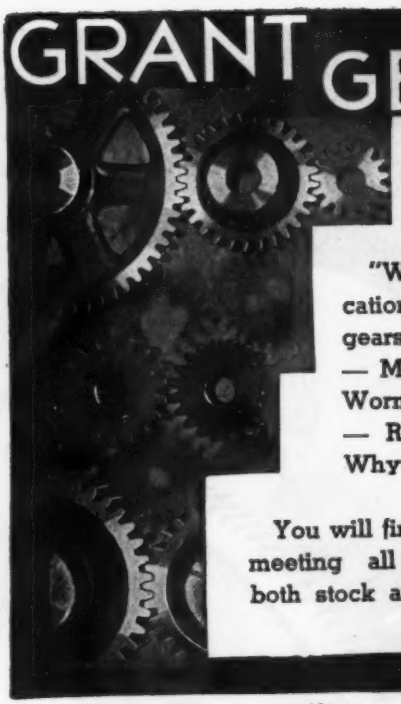

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You will find GRANT service meeting all requirements of both stock and special gears."

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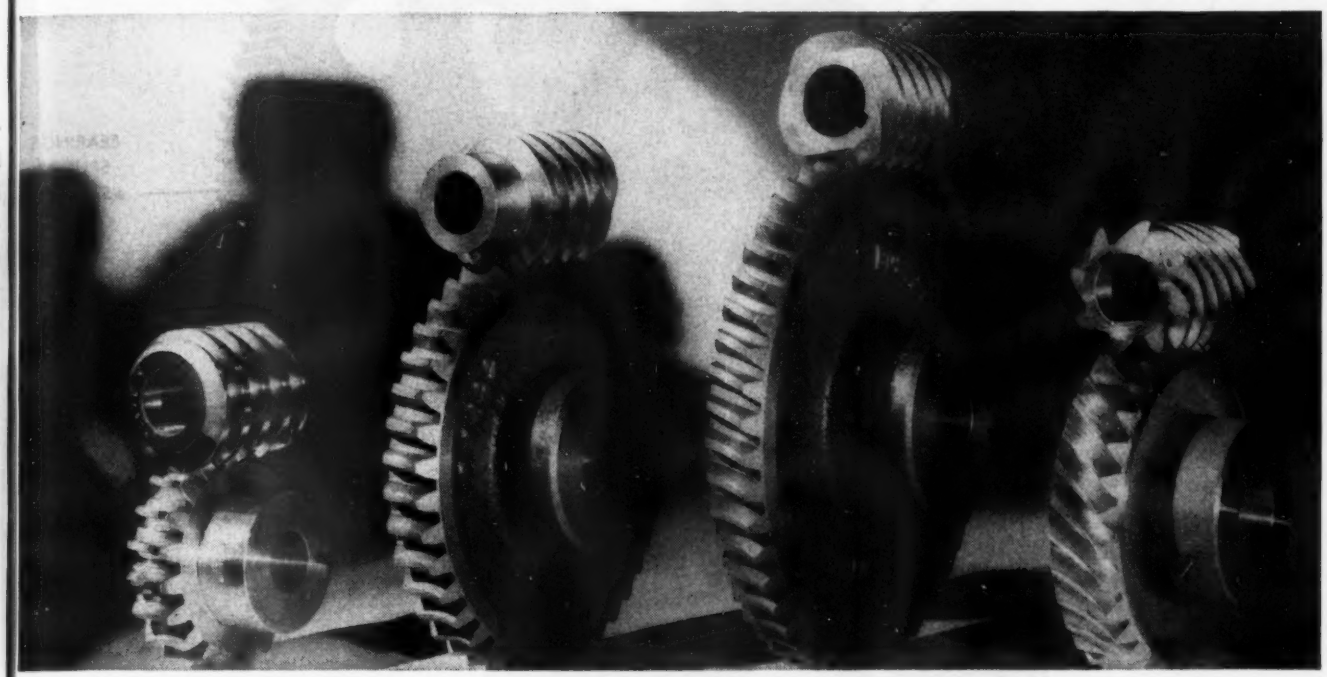
WORMS & WORM GEARS



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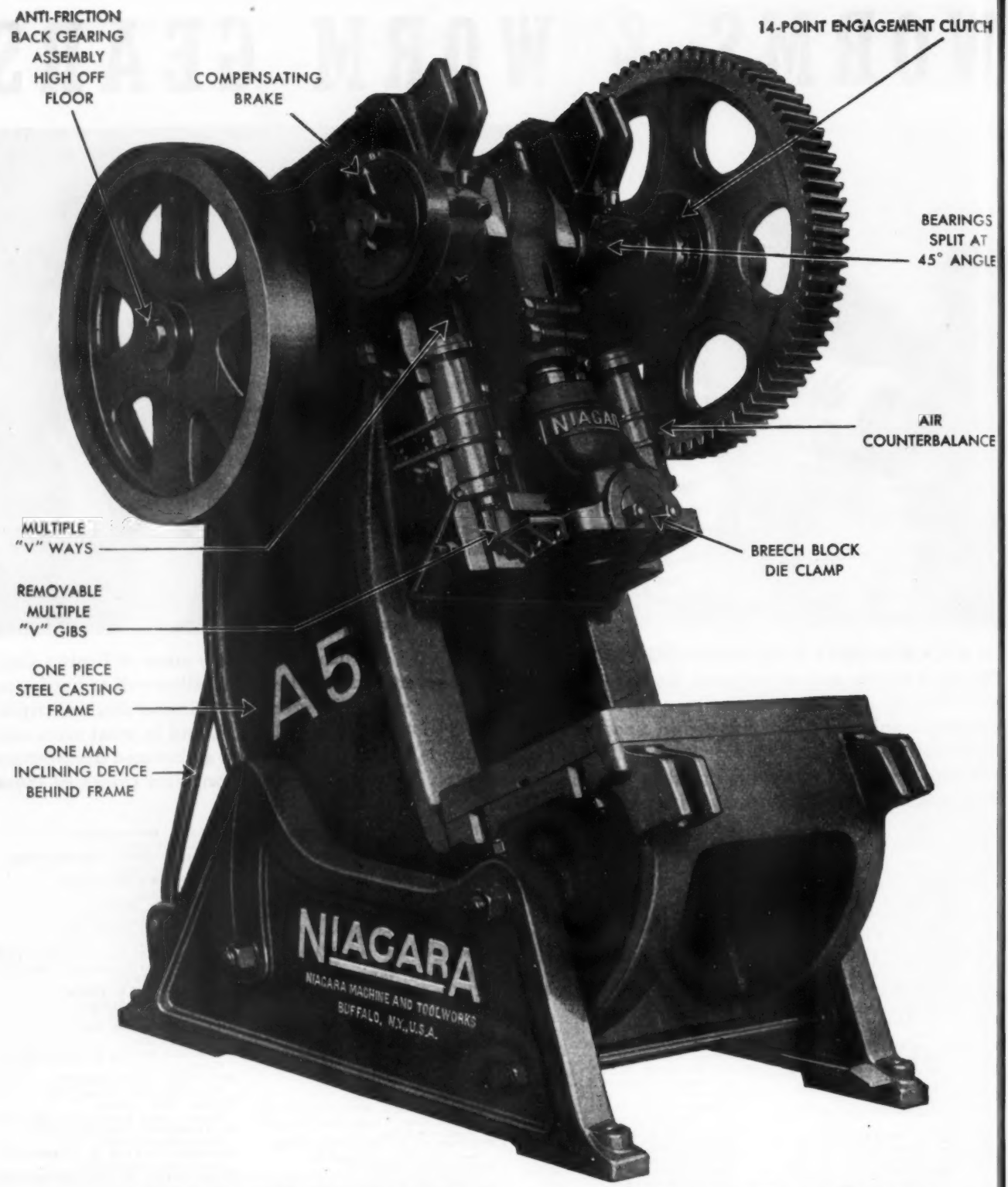
BOSTON GEARS



America's War Production Program is being speeded up by the use of Niagara Open Back Inclinable Presses. The No. A 5 shown above is one of the complete, well graduated Niagara line ranging from 7 to 190 ton capacities. Their many features contribute to LONG DIE LIFE AND MORE WORKING STROKES PER HOUR. Complete specifications are given in Bulletin 58, available upon request.

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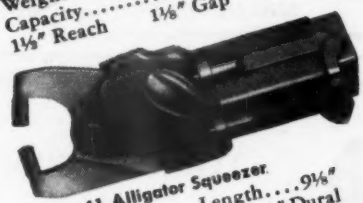
BUY UNITED STATES WAR BONDS AND STAMPS

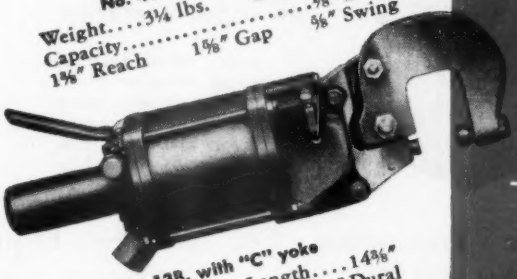
CLECO SQUEEZE RIVETERS

the right model for every job!

No. 41C, with Plunger through 7/8" yoke
Weight....4⅞ lbs. Length....9 15/16"
Capacity.....⅛" Dural
1½" Reach 1⅛" Gap ½" Travel

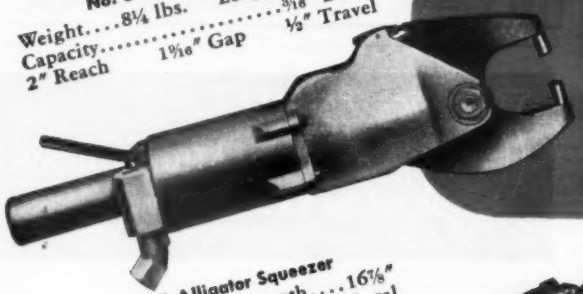


No. 41 Alligator Squeezer
Weight....3¼ lbs. Length....9⅛"
Capacity.....⅛" Dural
1⅝" Reach 1⅝" Gap ⅝" Swing



No. 13B, with "C" yoke
Weight....9 lbs. Length....14⅜"
Capacity.....3/16" Dural
2" Reach 1 9/16" Gap 11/16" Travel

No. 81C, with "C" yoke
Weight....8¼ lbs. Length....14⅝"
Capacity.....3/16" Dural
2" Reach 1 9/16" Gap ½" Travel



No. 82-2 Alligator Squeezer
Weight....7½ lbs. Length....16⅞"
Capacity.....3/16" Dural
2" Reach 1¾" Gap ⅝" Swing

No. 14A-5 Alligator Squeezer
Weight..20 lbs. Length..18¾"
Capacity.....3/16" Dural
5" Reach 2⅛" Gap 1¼" Swing

The complete Cleco line includes every type used in general aircraft manufacture—"alligator jaw", "C" yoke, "one-shot" and "blind" riveters are all available. These light powerful tools are fast and effective; they drive tight rivets with uniform heads, without causing distortion in the surrounding metal.

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Buy More War Bonds!

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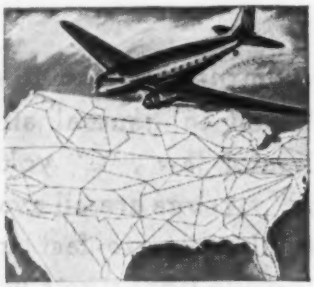

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Specify Air Express—Low Cost for High Speed

25 lbs., for instance, travels more than 500 miles for $4.38, more than 1,000 miles for $8.75, more than 2,000 miles for $17.50, at a speed of three miles a minute — with cost including special pick-up and delivery in all U. S. cities and principal towns. (Often same-day delivery between airport towns and cities.) Direct service to scores of foreign countries. Rapid air-rail service to 23,000 off-airline points in the United States.

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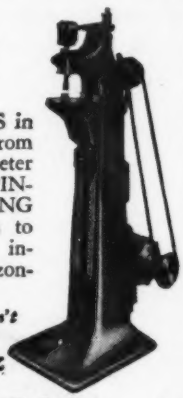

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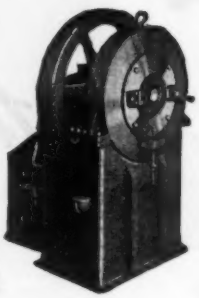

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— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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The ETNA MACHINE Co.

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For sanitary reasons a certain prominent manufacturing company wanted these parts for meat grinders made in single-piece stampings. But, because it is quite a trick in stainless steel to push through a neck off center like this and curl the edge, the only solution that was offered was a two-piece welded job—until the company put the problem up to **Presteel.**

We offer the successful result as another indication of our flexibility. Extraordinary tooling experience and fast, accurate presses will permit Presteel, when the time comes, to turn to civilian production immediately — without the problems of equipment reconversion. Meanwhile Presteel engineers will be glad to help you with your new design or redesign planning. Write to

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AVAILABLE IN 8 SIZES—
CAPACITY, 6 TO 80 TONS

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"With Very Close Tolerances"

Here is one of six Federal Presses in operation at The Wadsworth Watch Case Co., forming tiny bearing parts. "These operations are of a most exacting nature," says Wadsworth, "and demand that work be held at very close tolerances." A typical example of Federal Press accuracy. These presses are performing many other highly specialized jobs in hundreds of plants. Equipped with similar automatic loading and ejector mechanisms, and automatic stops, they often increase production speed as much as 4 to 5 times over hand operations. Their versatility is practically unlimited. Write today for latest catalog on the complete line.

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Whether you have a mass production, short-run or a combination of both types of turning jobs, the Sundstrand Automatic Lathe can possibly turn them faster. The simplicity of cycle changeover and set-up, for instance, permits setting up some jobs in less than 30 minutes . . . making it profitable to tool up for short-run turning. Naturally, these savings are also available and desirable for turning long runs.

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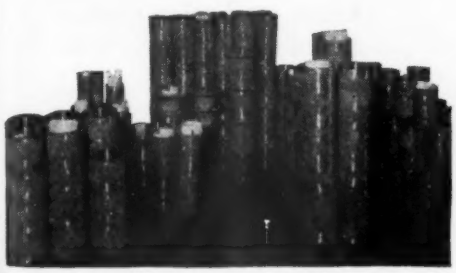
Turning 1000 Different Bushings

● Parts — Bronze bushings • Lot Sizes — 4 to 200 • No. of Machines formerly — 2 • No. of Sundstrand Lathes — *One* • Longest Changeover Time — 30 minutes • Production Increase — *Doubled*



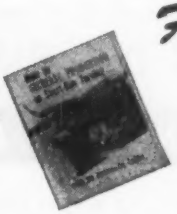
Turning 75 mm. Shot

● Part — Armor-piercing Shot
Tooling — Special
Lot Size — Continuous Production
Operation—Turn and form nose from rough blank
Features — Lathe provided with heavy spindle to take extra heavy forming cuts.

Turning Gear Blanks

● Parts — Gear Blanks, Sprockets, pulleys, sleeves, etc.
No. of Machines—2
No. of Operators—1
Lot Size — 24 to 100 pieces
Lot Size this job—30
Former Time—45 min.
Present Time—10 min.
Savings—35 min. per piece

Free GUIDE TO FASTER TURNING



● This 44 page booklet, crammed full of technical data and other valuable information can be a valuable guide in checking the effectiveness of your present turning operations. Processing gear blanks, tips on processing other work, how to select the proper lathe and many other valuable features are described and illustrated. Write for your copy today. Ask for Bulletin 133.

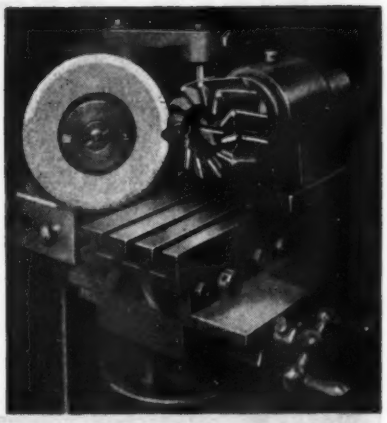
ARMY NAVY

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U. S. A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT • DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

STANDARD MILLING CUTTERS *Kept Sharp* WITH THE COVEL NO. 22 UNIVERSAL



Set-up for sharpening a shell end milling cutter. Standard Radius Grinding Attachment mounts directly on table, has two micrometer adjustable cross slides and 360 degree pivot. Height from base to top of table is 6". Top slide is 4⅜" wide x 12" long and moves 6".

WITH THE COVEL NO. 22 UNIVERSAL CUTTER AND TOOL GRINDER

on the job, you can stop worrying about the high cost of cutter replacements. Mount a COVEL Standard Radius Grinding Attachment on the No. 22 and put that pile of dull cutters back to work—with cutting edges perfectly sharpened and ready to knock production costs into a tailspin.

See your nearest COVEL Dealer or Write for Bulletin AM-45

GRINDING MACHINERY SINCE 1874

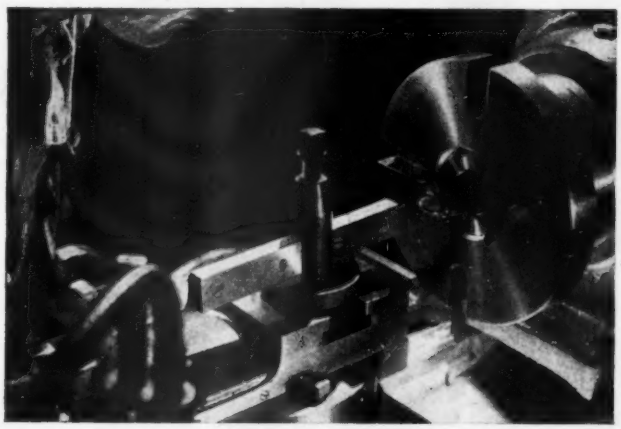
COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

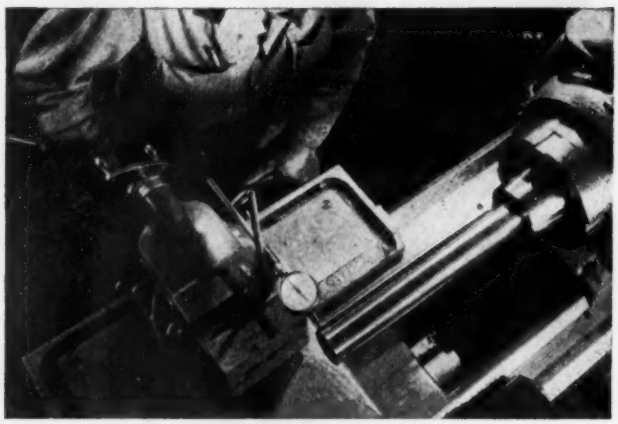
Hendey
LATHE TESTS

Many mechanical tests of established worth are applied to each *Hendey* LATHE while it is being run off in the inspection department.

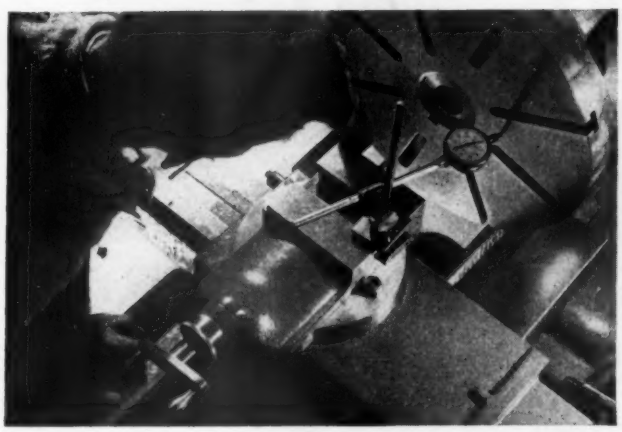
These four illustrations with a brief description of each show a characteristic group of such tests, of which there are many others of equal importance. Each and every test when made has to be approved in its determination by the chief inspector before the lathe being tested is released for shipment.



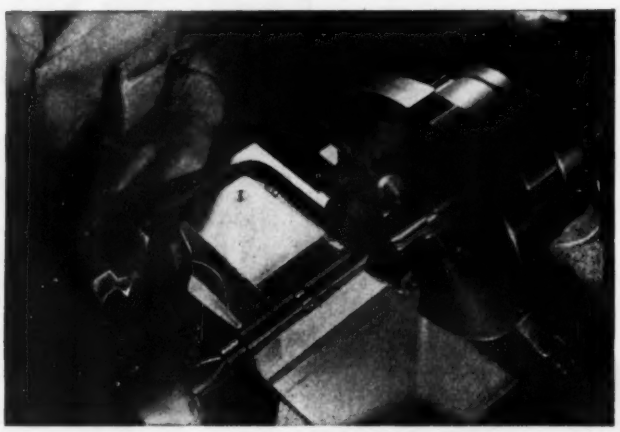
Testing taper hole in spindle for true running. Must register zero on indicator.



Testing alignment of spindle with ways of bed; also showing that taper hole in spindle is in perfect alignment.



Face plate test to prove right angled alignment of cross slide ways with bed ways.



Cutting test thread to check accuracy of feed gearing and lead screw

1874 71 years of continuous application to the manufacturing of machinery and machine tools of high standards. **1945**

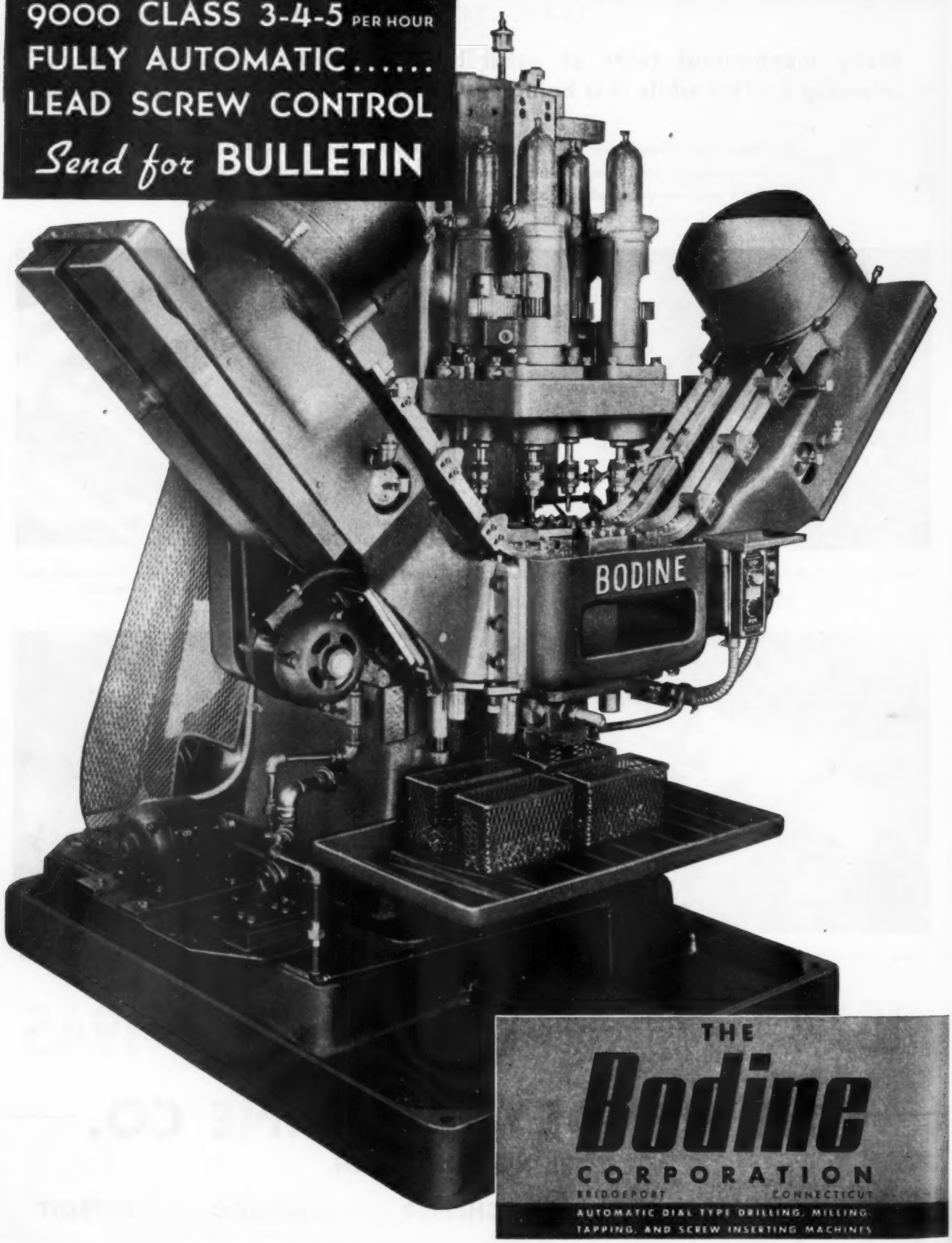
THE HENDEY MACHINE CO.

TORRINGTON, CONN.

BOSTON NEW YORK ROCHESTER CHICAGO DETROIT

LAST WORD IN *Precision* NUT TAPPING

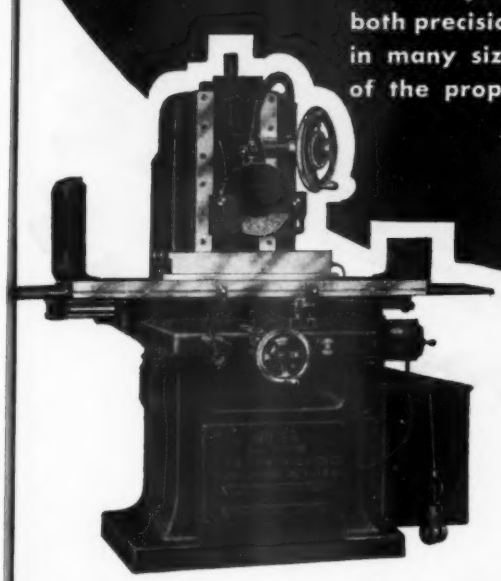
9000 CLASS 3-4-5 PER HOUR
FULLY AUTOMATIC.....
LEAD SCREW CONTROL
Send for BULLETIN



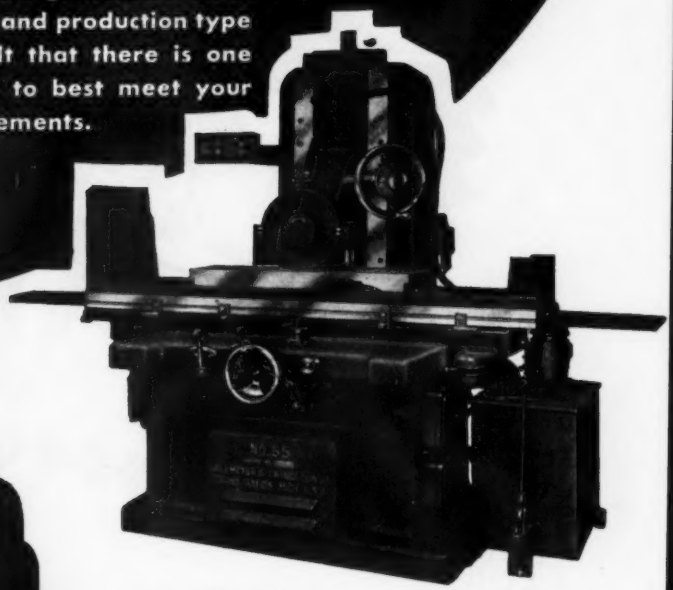
THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING,
TAPPING, AND SCREW INSERTING MACHINES

GRAND RAPIDS
HYDRAULIC FEED SURFACE
Grinders

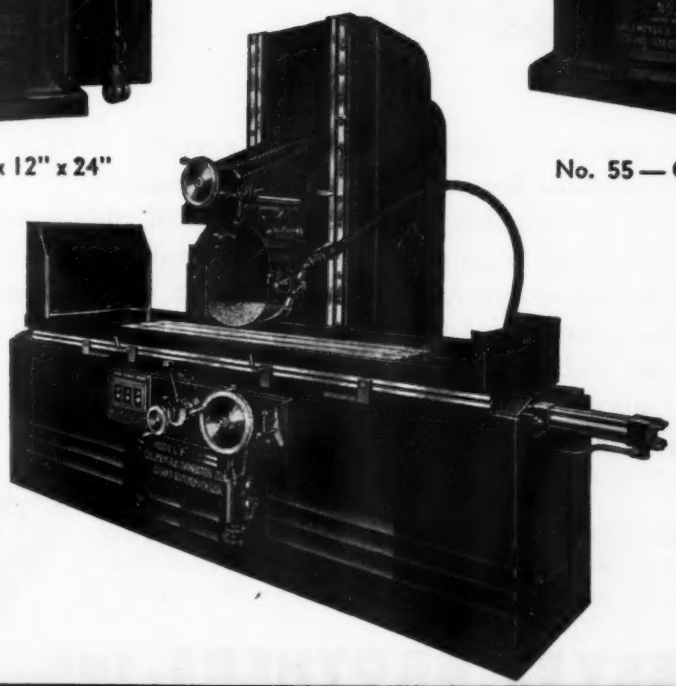
GALLMEYER & LIVINGSTON COMPANY is today building what is without question the finest, smoothest, and fastest Hydraulic Feed Surface Grinders of their entire career — a direct result of over 35 years of experience in the design and production of high grade precision grinding machinery. These machines are manufactured in both precision tool room type and production type in many sizes with the result that there is one of the proper size and type to best meet your particular requirements.



No. 35 — Capacity 8" x 12" x 24"



No. 55 — Capacity 12" x 17" x 36"



Precision Tool Room Type Machines

This is the type of GRAND RAPIDS Hydraulic Feed Surface Grinder on which one prominent machine tool builder obtains a 5 micro inch finish operating machine at 125 feet per minute. They are illustrated and described in bulletin GL-100.

Production Machines

GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders manufactured by the GALLMEYER & LIVINGSTON COMPANY are designated as Model F and Model A and feature the use of wide faced wheel and cross traveling head. GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders are illustrated and described in bulletin GL-4-1-43. Write for your copy today.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE. S. W.

GRAND RAPIDS, MICHIGAN

TO GET EXTRA SERVICE FOR THE LONG PULL—*DEMAND*

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"

Fleet operators from coast-to-coast specify *invasion-tested* Reeves Army Twill. Wherever durable, good-looking uniforms are needed, this top-quality fabric tailors smartly and gives superb service. Over 80 million yards of it have already been used to help equip America's fighting men, and it is proving itself under the toughest climatic and combat conditions of global war. This fabric, Sanforized Shrunk* and color-fast to sun, water and perspiration, will meet *your* post-war uniform needs. When the time comes to order them, choose from a wide range of popular colors, for long-lasting good looks insist on Reeves Army Twill.

**Residual shrinkage less than 1%*

THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill • Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth • Marine Herringbone • Mountain Cloth • Warrior Twill*

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REEVES BROTHERS, INC.

54 WORTH STREET • NEW YORK 13, N. Y.

Mills Mill, Greenville, S. C. and Woodruff, S. C.
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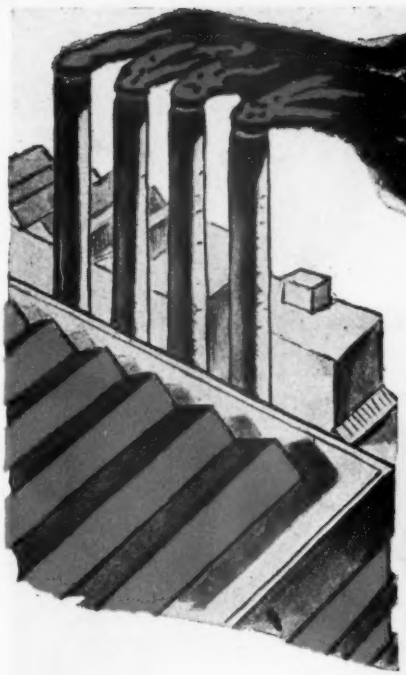
Representatives in Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • St. Louis • Montreal • Toronto



DON'T LET PRE-WAR METHODS KILL POST-WAR PROSPERITY!

The war years have proven to American Industry that the light machine tool has an important place in Production. Walker-Turner machine tools have demonstrated their ruggedness under most exacting conditions.

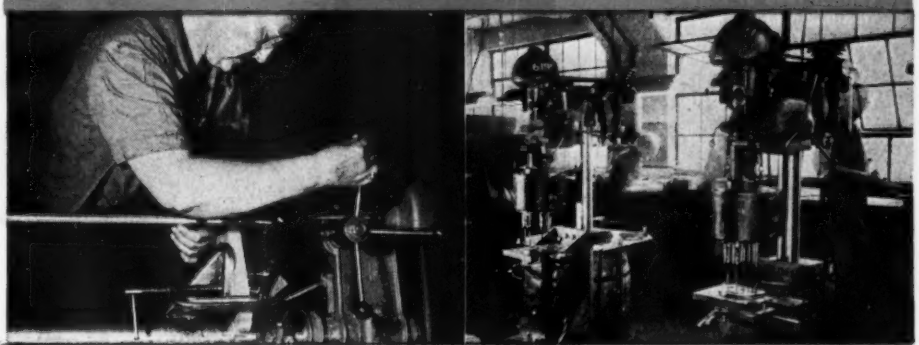
Don't let pre-war operating methods affect your post-war competitive position. The versatility of Walker-Turner machine tools will ensure production equal to—and, in many cases, better than—heavier and more expensive equipment.

WALKER-TURNER COMPANY, Inc.
Plainfield **New Jersey**

HERE'S HOW WALKER-TURNER MACHINE-TOOLS CUT COSTS!

260-5200 R.P.M. 60-5300 S.F.M. 160-8300 R.P.M.

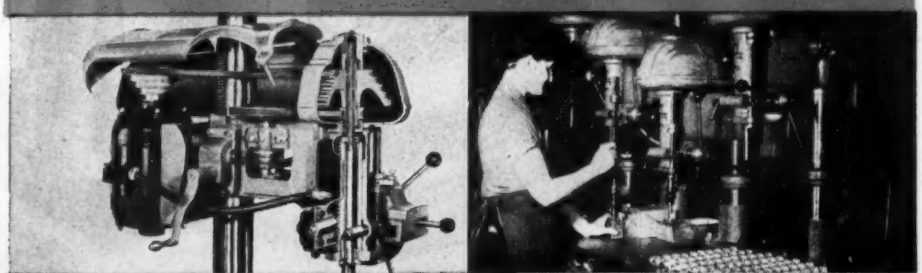
Wide range of operating speeds enables you to select the optimum cutting speed for any material.



Walker-Turner flexibility saves time and cuts costs in special tooling set-ups.

Set up horizontally, this Walker-Turner 15" Drill Press flares the ends of tubing.

This Walker-Turner 20" Drill Press drills five holes and reams two holes in one operation.



Low power consumption reduces operating costs.

This motor on a Walker-Turner 20" Drill Press provides speeds for drilling up to ¾" in steel, 1" in cast iron.

Low price decreases capital investment.

This Walker-Turner 4-spindle 20" Drill Press costs no more than a single heavy unit, yet has several times its production capacity.

walker-Turner COMPANY, Inc. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Longitudinal Feed — 20"
Cross Feed — 9"
Vertical Feed of Knee — 16"
Standard Table — 9" x 32"
Special Tables up to 48" available, also longitudinal power feed
Weight with Shaping Unit — 2000 lbs.

THE BRIDGEPORT TURRET MILLING MACHINE has won universal acceptance. It has proved a most valuable time and labor saver in the tool rooms and production departments of the largest plants. Its wide range and versatility in milling, drilling, boring and shaping enable it to serve as the complete central machine around which all operations revolve in many small shops. It will pay you to explore the possibilities of the "BRIDGEPORT" in your plant.

The **Bridgeport** MACHINES, Inc.
Bridgeport, Conn.

ABRASIVE M-34 VERTICAL SPINDLE { NEW POWERFUL ACCURATE GRINDER

Abrasive No. M34 Vertical Spindle Surface Grinder takes exceptionally heavy cuts with excellent finish. The powerful motorized spindle eliminates belting . . . provides more power at the cutting point and minimizes vibration.

Write for complete information and specifications in new Bulletin.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

ABRASIVE MACHINE TOOL COMPANY • EAST PROVIDENCE 14, RHODE ISLAND

"No more production worries for him! He turns out the stuff faster than you can say 'Special Machinery' with new equipment built by FENN — and doing a better job, too."

Junk old machines that are eating their heads off every day. Get away from the idea of remodeling or rebuilding out-dated equipment. Start fresh with new, special machinery that is designed for faster, better, lower cost production.

FENN Special Machinery is custom-built to meet the individual needs of the user. Fenn experts have had years of experience in designing and perfecting not only the machines but the tools required to operate them.

When you put the Fenn organization to work building the modern machines demanded by today's production you are planning for profits. Why not get in touch with FENN?

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT
Special Machinery For Efficient Production

Friction Sawing with Tannewitz HIGH SPEED BAND SAWS

Trimming formed parts . . . Cutting Sheet Steel, 1-inch Armor Plate, Plastics or what have you . . .

"The process is to some so spectacular that they refuse to believe their own eyes, *and so safe, a woman can operate the machine.*" So writes the chief tool research engineer for one of the largest aircraft corporations. Previous cutting costs are radically reduced, difficult and slow cutting of certain materials made swift, easy and safe. By all means write for your copy of "FRICTION SAWING" by Arthur A. Schwartz, Chief Tool Research Engineer, Bell Aircraft Corporation, which will soon be off the press. It's free.

Write for Your Copy

THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

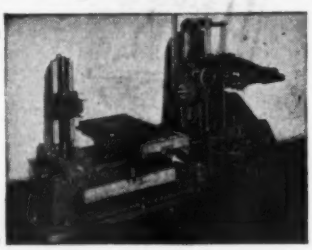
For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

Giant KEYSEATERS

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

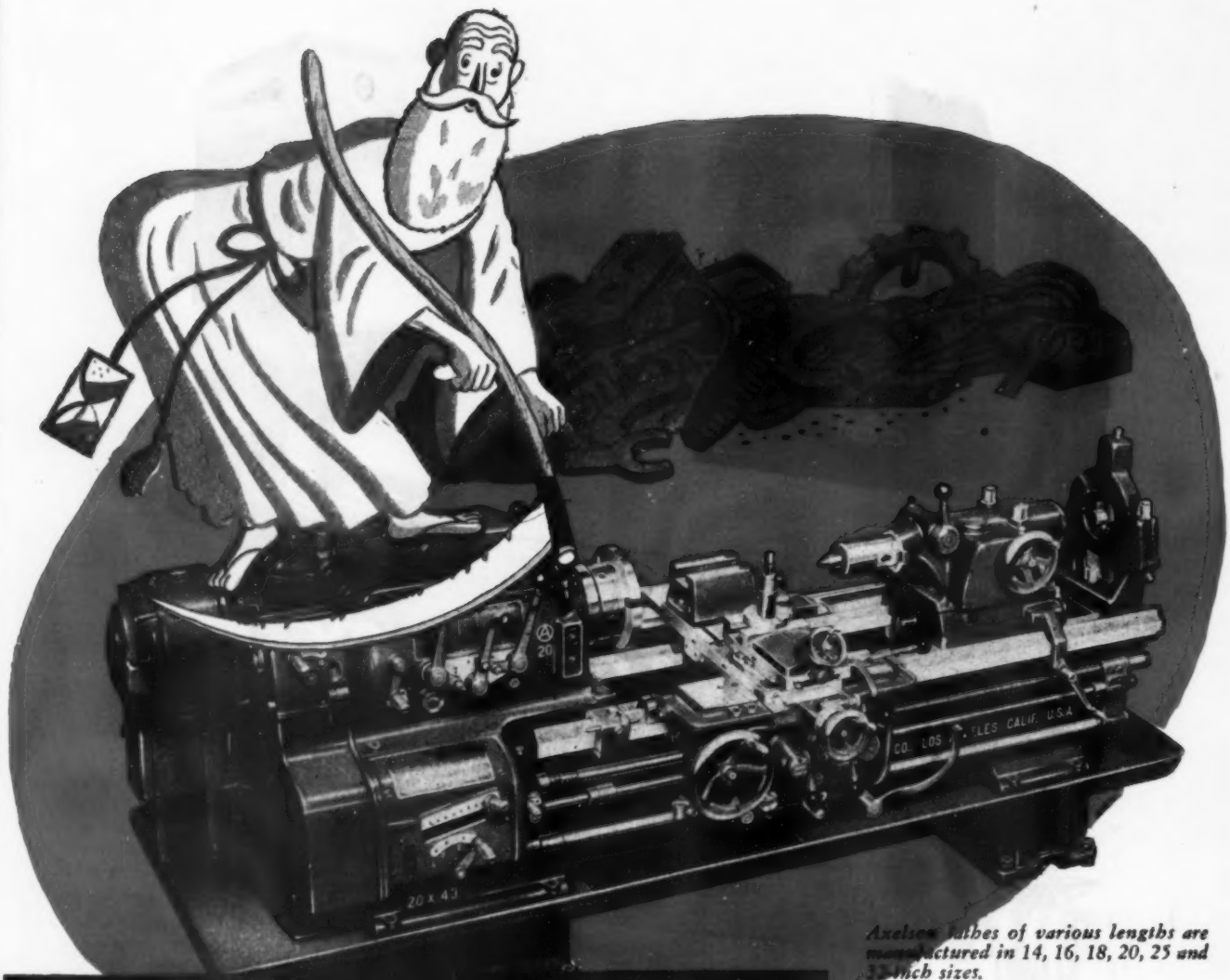
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

POWER
geared to ACCURACY
Defiance engineering leadership builds ahead-of-the-times power, accuracy and beauty in Defiance Machines! Shown here are a Defiance-built Unit Head Production Machine... Plastic Preforming Press... Quick Change Drill... and Horizontal Boring Mill. Unbeatable for accurate, low-cost, long-life operation! Write for catalog. Defiance Machine Works, Inc., Defiance, O.
DEFIANCE
BUILDERS OF PRECISION MACHINERY SINCE 1850



Axelson lathes of various lengths are manufactured in 14, 16, 18, 20, 25 and 32 inch sizes.

BUILT TO *Endure*

An old proverb states, "Time is a noiseless file"... Passing ceaselessly over everything, time files away the shiny finish and surface quality—wearing its way into the vitals... The old gent with the scythe leaves behind him a waste of derelict and worn out machinery as he makes his way through any field of industry.

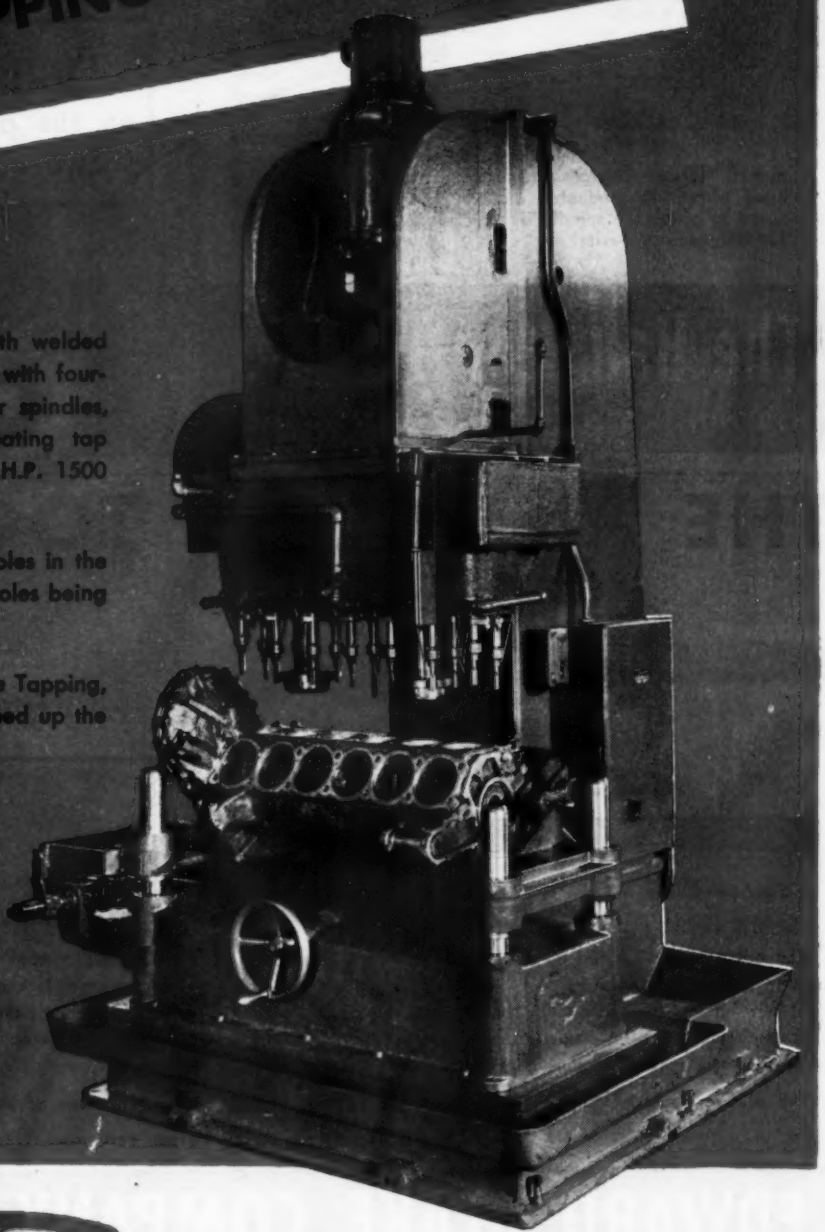
Sometimes Father Time is astonished as some supreme example of good workmanship, prideful engineering and manufacturing skill resists the attacks by which he demolishes lesser products... He dulls his scythe against the great Axelson Heavy Duty Lathe as his aged eyes pop out in amazement... For the Axelson Lathe is indeed *built to endure*... Built under one roof, from foundry to finishing, it is "followed through" by Axelson's rigid engineering and manufacturing formulae—guaranteed by over thirty years of constant striving for perfection... A great machine tool, resisting time by such scrupulous standards and materials as to challenge years of hard use to do their worst.

AXELSON MANUFACTURING COMPANY
6160 S. BOYLE AVE. (BOX 98, VERNON STATION), LOS ANGELES 11, CALIFORNIA • 50 CHURCH STREET, NEW YORK CITY 7
3844 WALSH STREET, ST. LOUIS 16, MO.

AXELSON LATHES
Dependable for over a Quarter Century

BUY WAR BONDS!

Tapping 28 holes in cylinder bank faces . . . with a BAUSH VERTICAL INDIVIDUAL LEAD SCREW TAPPING MACHINE . . .



THIS sturdy, rigid Baush machine with welded steel base and column, is furnished with fourteen individual lead screw fixed-center spindles, each spindle being fitted with a floating tap holder. Spindles are driven by a 10 H.P. 1500 R.P.M. motor with disc brake.

The operation consists of tapping 28 holes in the top half of an airplane crankcase, 14 holes being tapped in each cylinder bank face.

Baush Machines . . . for Multiple Spindle Tapping, Drilling and Boring . . . are helping speed up the production of war materiel. They are the result of more than fifty years specialized experience in the design, development and manufacture of high production machine tools.

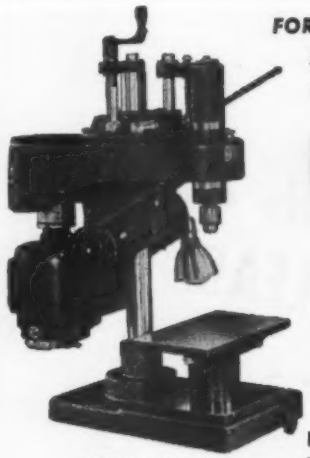
Baush experience and facilities are available to help you meet and solve your problems in drilling, tapping and boring.

ARMY E NAVY

BAUSH

MACHINE TOOL CO.

Springfield 5, Mass.



FOR GREATER SPEED RANGE, SENSITIVITY AND EASE OF OPERATION . . .

HAMILTON

"VARIMATIC"

. . . SUPER SENSITIVE, VARIABLE SPEED DRILLING MACHINES!

★

LOW RANGE
Min. Spindle Speed 848 — Max. Spindle Speed 2700

HIGH RANGE
2900 — 9300

DRILL CAPACITY
.004" to 5/16"

Here's a unit built with "instrument precision", fully capable of handling the finest work for both defense and peacetime production. Combining sensitivity and ease of operation, the "VARIMATIC" allows instantaneous, variable speed adjustment in two ranges. (Speed changes are accomplished by means of a hand wheel. A graduated dial on hand wheel shows the speed at which the spindle is operating.) A letter will bring complete details—write!

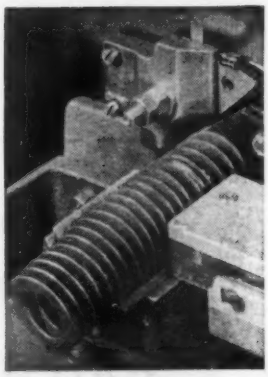
The Hamilton Tool Co.

820 NINTH ST. HAMILTON, OHIO

BUILT BY SEIFERT

AUTOMATIC . . . ACCURATE
SOUNDLY ENGINEERED

Constructed to perform a special wire-winding function, this Seifert-designed and built machine is indicative of the many produced by Seifert for leading manufacturers throughout the world. For your automatic machine problems, consult Seifert.



E. R. SEIFERT, Inc.
Syracuse, N. Y.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

THE AMERICAN TOOL HOLDER

holds

3
BIT SIZES IN

4
POSITIONS

The advantages of American Tool Holders for tool room work are readily appreciated by lathe operators. The American is built in four sizes to handle bit capacities of 1/8" to 7/16", either round or square. The positive-locking swivel head can be used in 4 positions for either right- or left-hand turning and boring, and the head *and* bit are locked in any of these positions *with a single bolt*. The tool bit is held parallel to the shank instead of at an angle, requiring, therefore, less grinding for clearance. This feature also gives a larger body of metal to absorb the intense heat that is generated at the cutting edge of the tool.

The wide gripping action allows use of very short bits, and HSS or Stellite can be used without any tendency toward breakage.

Use the coupon to obtain the newest folder.

EDWARD BLAKE COMPANY

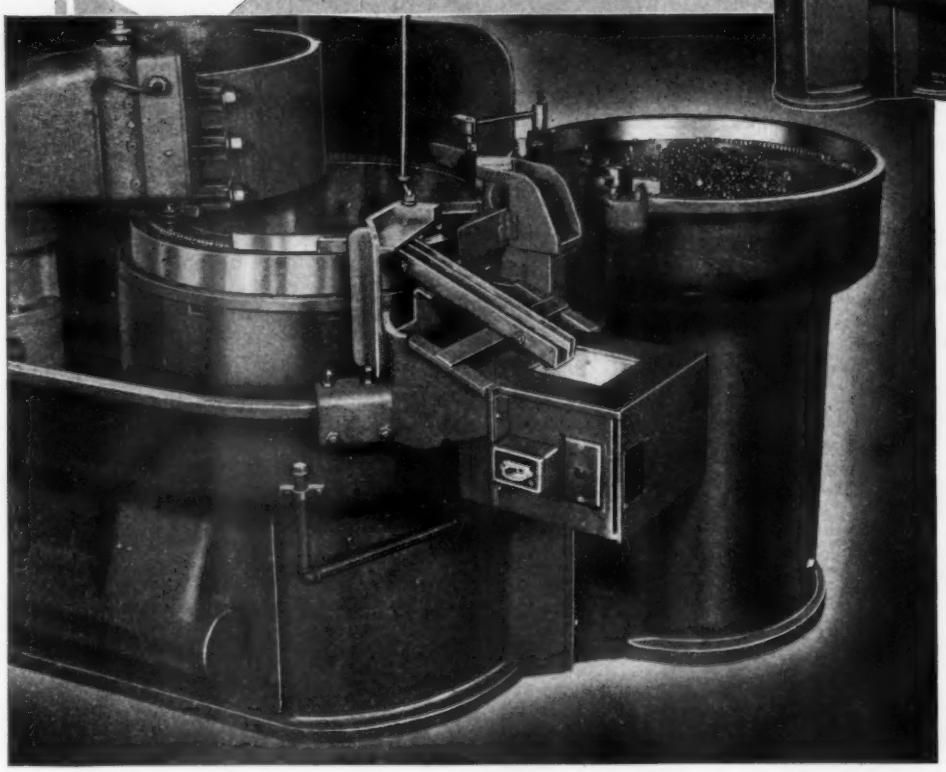
634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

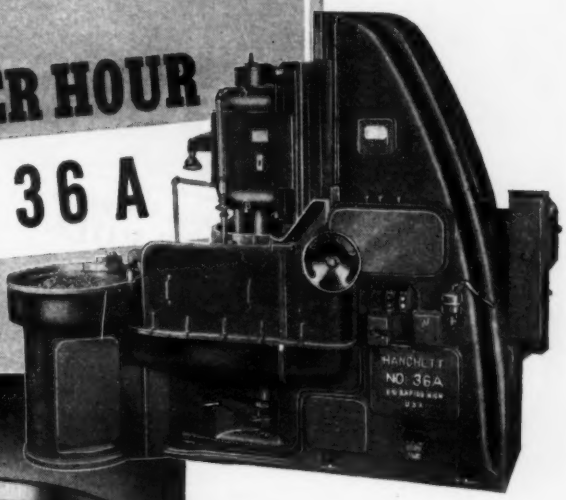
BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — WALTHAM CUTTER SHARPENERS

Please send me your new folder which describes the American Tool Holder in detail.
AM

Name..... Title.....
Company.....
Street.....
City..... State.....

GRINDING 9000 PIECES PER HOUR ON THE HANCHETT 36 A





It's Automatic

Tough to handle steel castellated nuts feed from loader onto magnetic work table, pass under grinding wheel, slide down chute through demagnetizer — at the rate of 9000 per hour.

Hanchett No. 36A stands for high production and accurate finishing whenever grinding is discussed.

For further details see your nearest Hanchett dealer or write for Bulletin 145-AB.

With one pass under the horizontal grinding wheel, 150 steel castellated nuts (7/16" across flats) are precisely ground, on one side — EVERY MINUTE — then the opposite side is ground at the same rate. And what's more, a total of .015" stock is removed. That's really making a tough grinding job look easy.

On this particular Hanchett No. 36A Rotary Surface Grinding application, parts are semi-automatically loaded — discharged automatically from the magnetic work table and chuted through the demagnetizer.

Hanchett prides itself in turning the tough grinding jobs into high production ones, held to really close tolerances. Hanchett engineers will be glad to show you how a 36A or one of their other equally superb surface grinders can DOUBLE, TRIPLE, or QUADRUPLE your finished grinding production time.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

INDUSTRY POLL POINTS TO PLAN-O-MILL!

Here's how **PLAN-O-MILL** *measures up to Industry's demand*

The Bramson Publishing Company's
PRODUCTION POLL
of the Metal-Working Industry

• Staff editors of this publication believe the answers to these questions may guide readers toward an enlightened outlook on postwar mass production. Answers gathered from the field, from the more than 20,000 readers of this magazine and at its PRODUCTION Round Tables each month, will undoubtedly reflect the thinking of the metal-working industry in the U. S. and Canada.

QUESTION	Per Cent Replying YES	NO
1. Do you envision greater precision in postwar manufacturing?	50%	50%
2. Where advisable, will you replace pre-war equipment with war-built or D P C equipment?	70%	30%
3. Are changes in machine tools indicated to fully utilize improvements in cutting tools?	100%	
4. As a general rule, should machinery controls be changed so as to provide greater motion economy on the part of operators?	100%	
5. Do you favor electronic controls?	93%	7%
6. Are lubrication systems on machine tools today efficient, adequate and accessible?	3%	97%
7. Do you see a trend toward a reduction in stock removal for finish, by such means as precision forming, casting, forging, stretching etc.?	94%	6%

inadequate. The ... of color PRODUCTION Round Table poi...

July 1944—*Tool Engineer.*

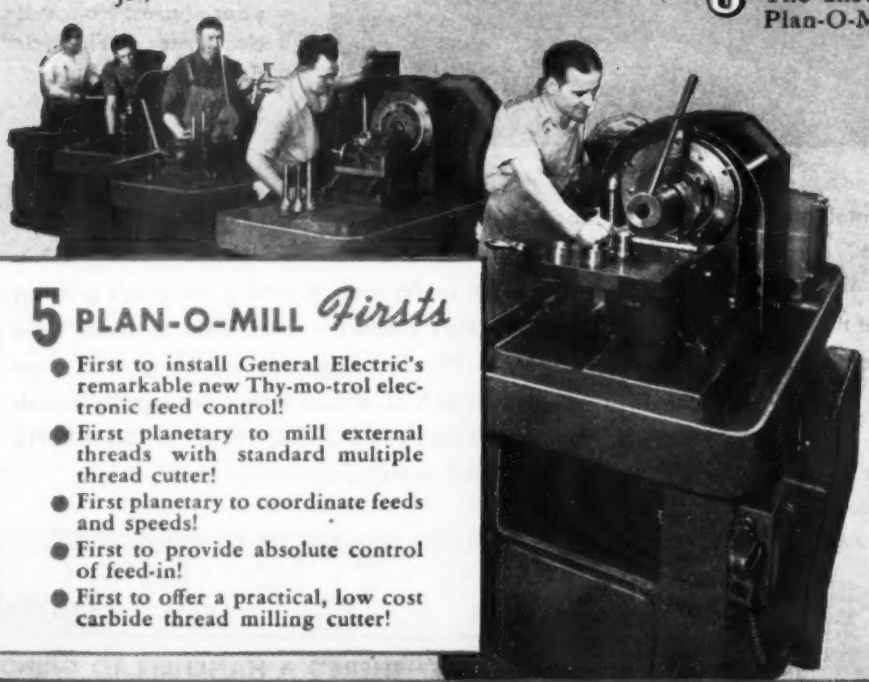
1 Plan-O-Mill does a precision job at a production rate.

3 Plan-O-Mill is up to the minute in efficient use of cutting tools, either high speed steel or carbide.

4 Plan-O-Mill is electrically controlled—one push button for complete cycle.

5 Plan-O-Mill was the first planetary to install electronic feed and speed controls.

6 The answer is "YES" for Plan-O-Mill.



5 PLAN-O-MILL *Firsts*

- First to install General Electric's remarkable new Thy-mo-trol electronic feed control!
- First planetary to mill external threads with standard multiple thread cutter!
- First planetary to coordinate feeds and speeds!
- First to provide absolute control of feed-in!
- First to offer a practical, low cost carbide thread milling cutter!

If your war or postwar products involve internal or external threading, or cylindrical forming, now is the time to replace obsolete, wasteful machines with Plan-O-Mill. Contact your machinery dealer or write direct.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-ED MILLING CUTTERS

GEARGRIND

UNIVERSAL·OSCILLATING CHUCKING GRINDER

● This versatile grinder was designed to handle external and internal cylindrical and conical surfaces, generated or formed spherical external and internal surfaces and generated or formed annular surfaces, such as ball bearing races and fillets.

In addition, this machine grinds combinations of the above in a single set-up, insuring both extreme accuracy and perfect blending of curved with straight surfaces.

The construction incorporates many features that result in accurate, fine finish, and low production costs —heavy, vibration-free base; precision preloaded bearings for vertical oscillating spindle, work head spindle and grinding wheel spindles, grinding spindles dynamically balanced; quick acting clamping attachments for collets or diaphragm chucks; micrometer feed screws for work head set-up and grinding wheel spindle; adjustable diamond wheel trueing devise.

Write for Folder

Contains full description of all features, complete specifications and types of work handled.

GEARGRIND FORMED WHEEL GRINDING

Investigate the complete line of GEARGRIND Machines for the Formed Wheel Grinding of external and internal gears, external and internal involute splines, straight splines, serrations and racks. Also special GEARGRIND Machines for special grinding operations.

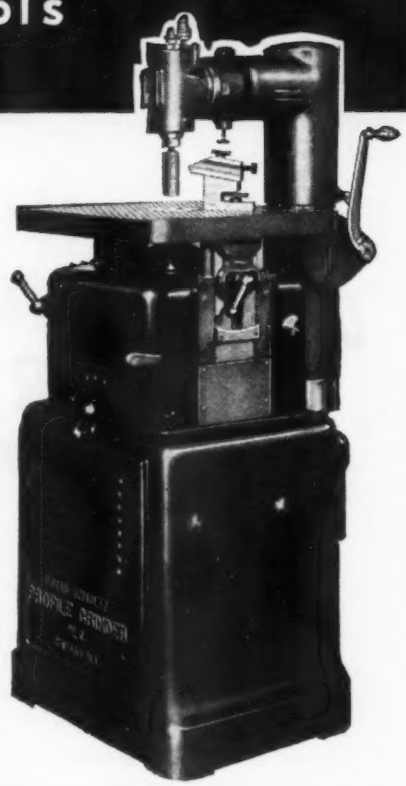
CONTRACT GRINDING SERVICE

ARMY (E) NAVY

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH. U.S.A.

Manufacturers of the
RZEPPA
Constant Velocity Universal Joint.

BOYAR-SCHULTZ PROFILE GRINDERS
Vital Tools for making the Tools of Production . . . .



WITH the coming change from "all out" production for war, to production for fast growing peace-time needs, machines for making the tools of production are more and more important.

Boyar-Schultz Profile Grinders have long been recognized as "vital" tools in the tool and die shop. They are built for economically grinding and finishing irregularly curved surfaces and odd contours so frequently encountered in making dies, punches, templates, cams and special machinery.

No. 1
Profile Grinder, a bench size Profile Grinder operating at 20,000 R.P.M. for grinding and regrinding die clearances, sharpening punches, and economically grinding cams and templates.

No. 2
Profile Grinder, with two independently powered spindles operating at 10,000 R.P.M. with vertical oscillations. Stock is removed rapidly, even with wheels of small diameter.

BOYAR-SCHULTZ CORPORATION
2109 WALNUT STREET **CHICAGO 12, ILLINOIS**

CARLTON RADIAL DRILL

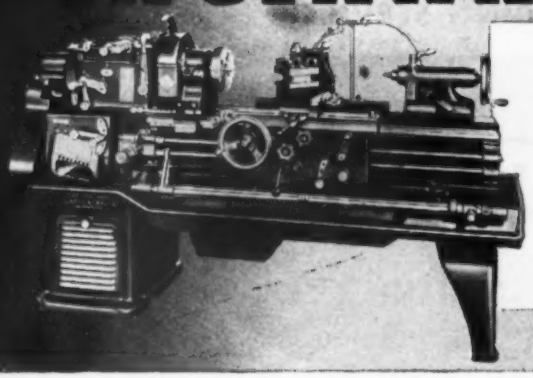
"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

CINCINNATI LATHES



Handling of close tolerance work with speed and economy is assured by Cincinnati Lathes. Every machine that leaves our plant is accompanied by a thorough inspection record showing exactly how that lathe passed a rigid series of tests. Hardened and ground headstock gears, anti-friction spindle and hand scraped ways, are among the features which contribute to precision performance. Produced in sizes from 14" to 30". Send for details.

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

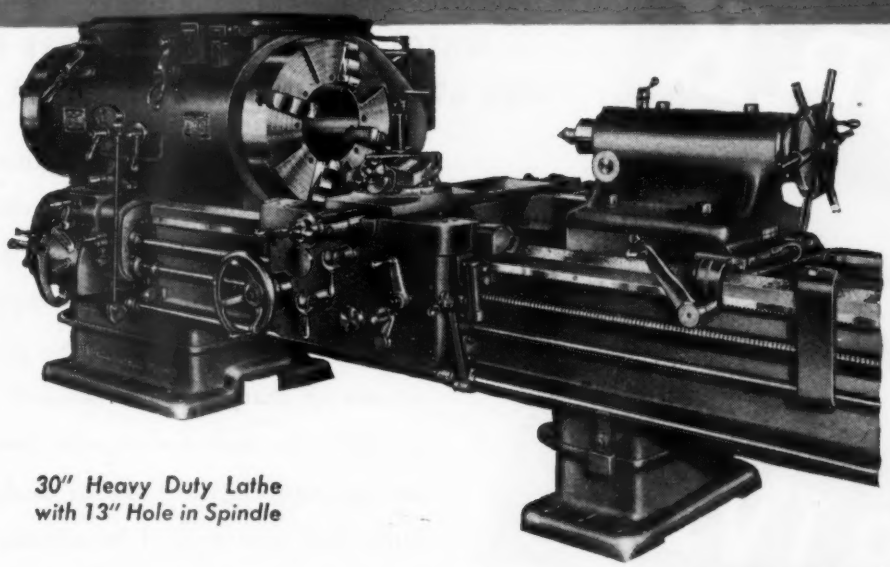
HIGH PRAISE from One of America's Biggest War Plants!

"HYDRATROL LATHES have been very satisfactory over a very intensive 3-shift operation for a long time. They have saved us many man hours."

(From letter in our files)

HYDRATROL LATHES

LARGE HOLLOW SPINDLE TYPE



30" Heavy Duty Lathe with 13" Hole in Spindle

5 sizes-18" to 36"

Small, 18" up to 7-1/4" Hole
Medium, 24" up to 12" Hole
Large, 27" up to 13" Hole
Large, 30" up to 14" Hole
Large, 36" up to 16-1/2" Hole

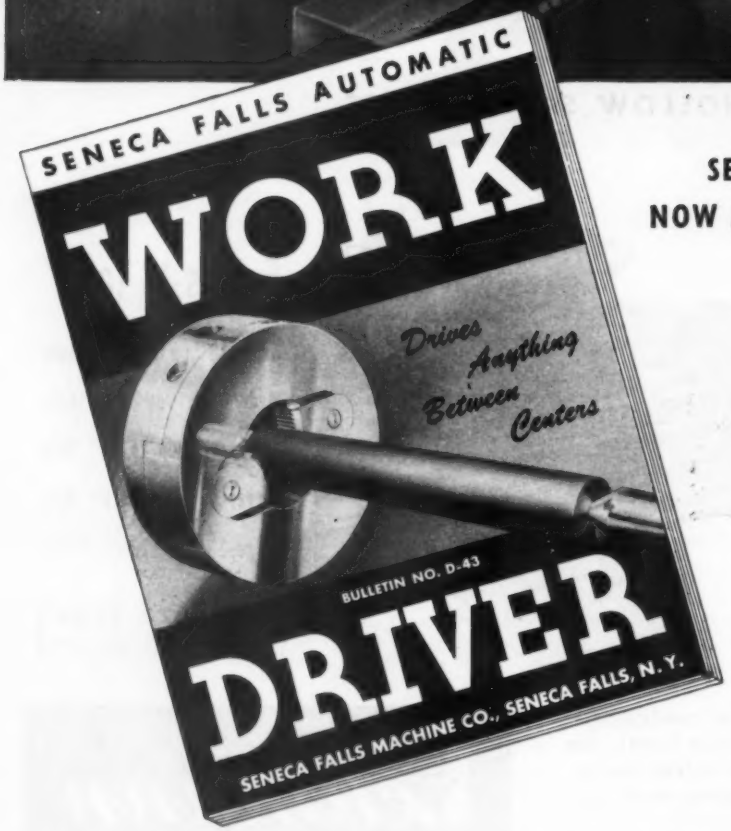
(*Standard Type lathes, 16" to 36"*)

In hundreds of plants — under all sorts of conditions — HYDRATROL LATHES (Large Hollow Spindle Type), are doing a better job than had ever been done before. Invariably they are increasing production, improving work, cutting costs.

The chances are that YOU can "do it better" on a HYDRATROL LATHE. Why not send us prints of your difficult, unusual or too-costly machining jobs, for a specific, time-and-money-saving recommendation.

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND
SAINT LOUIS 3, MISSOURI



SENECA FALLS AUTOMATIC WORK DRIVERS NOW AVAILABLE IN 18 STANDARDIZED MODELS

These self-centering, quick-action Drivers eliminate dogging time and enable one operator to operate two or more machines. Their positive grip prevents slippage and resultant tool breakage. No projecting screws or sharp corners to catch clothing or injure the operator's hands. Designed for use on any engine lathe or multiple tool lathe. Can also be used for certain work on turret lathes and grinding machines.

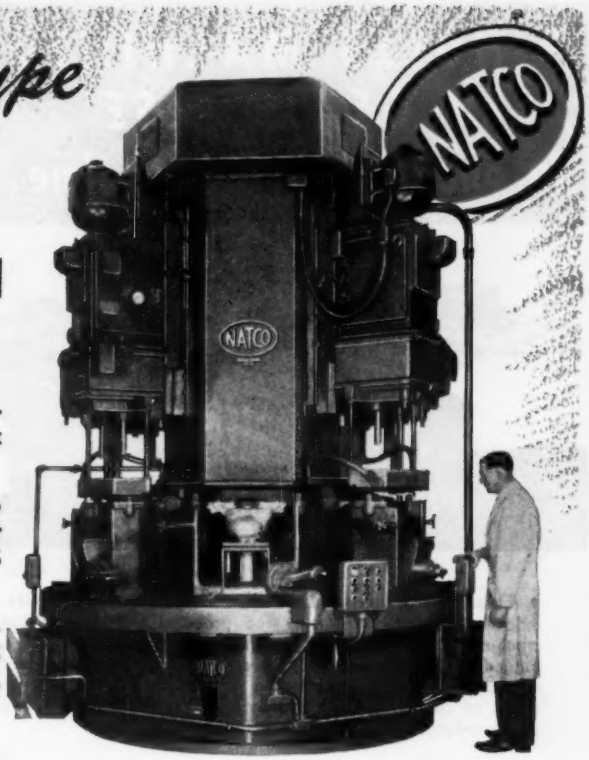
Write for your copy of Bulletin D-43. You can order direct from this convenient catalog.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS *from* SENECA FALLS

NATCO *Station-Type* Machine

"THE MACHINE OF BUILT-IN SKILL AND PRECISION"



Because the skill and precision are built into NATCO station-type machines, an unskilled operator can do work which would otherwise require long training.

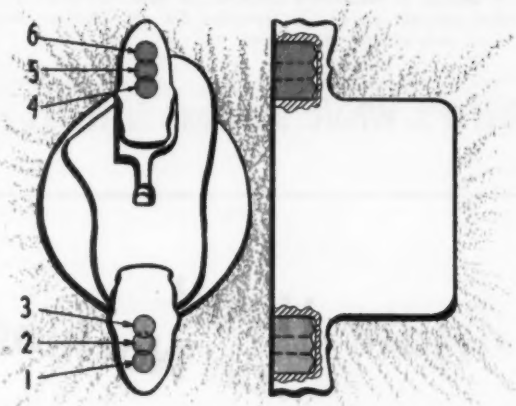
The NATCO shown here is an example. It is one of a group which process the holes in a forged aluminum cylinder head. This machine consists of five NATCO HOLEUNITS mounted vertically around the column.

NATCO station-type machines are built with various combinations of horizontal, vertical, and angular HOLEUNITS for drilling, boring, chamfering, counterboring, reaming, and tapping operations.

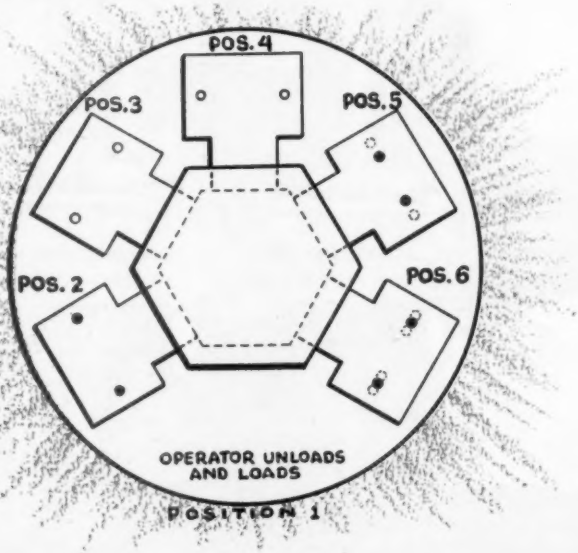
PRECISION, SPEED, ECONOMY

With skill and precision built into the machine, accuracy is assured. Hole machining is done more rapidly and economically than if done on separate units. Savings are effected in power, floor space, conveying equipment, and rehandling.

These are only a few of the many advantages of NATCO machines. The subject is fully explained in literature which is yours for the asking. Tell us what your "hole" problems are so that we can send appropriate bulletins, or have our field engineers call on you.



The above sketch illustrates operations performed on a forged aluminum aircraft cylinder head.



The diagram at the left illustrates the sequence of operations on the NATCO station-type machine. Five parts are operated upon simultaneously while the operator unloads and loads parts. The 100" diameter table indexes around the table automatically from one position to another to complete the following operations:

Position 2. Holes 1 and 6 are drilled for ¾" ream to 1⅞" depth.

Position 3. Holes 1 and 6 are reamed to ±.001".

Position 4. Holes 1 and 6 are combination counterbored and chamfered.

Position 5. Holes 3 and 4 are drilled ¾" dia. to 1⅞" depth.

Position 6. Holes 2 and 5 are drilled ¾" dia. to 1⅞" depth.

All operations are automatic from a push-button start.

Production, 50 parts per hour

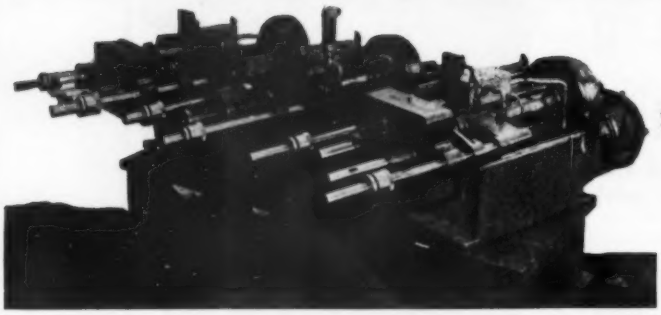
NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND.

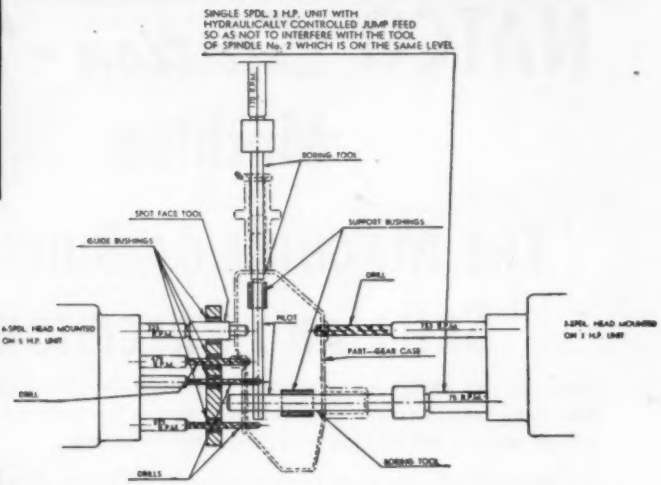
MULTIPLE DRILLING, BORING, AND TAPPING MACHINES

INVESTIGATE NATCO METHODS FOR THE LOWEST POSSIBLE HOLE COSTS!

SALES OFFICES: 1809 ENGINEERING BLDG., CHICAGO; 409 NEW CENTER BLDG., DETROIT; 1807 ELMWOOD AVE., BUFFALO; 2902 COMMERCE BLDG., NEW YORK CITY.

9 HOLES MACHINED IN GEAR CASE in one-eighth former time...




SINGLE SPDL. 3 H.P. UNIT WITH HYDRAULICALLY CONTROLLED JUMP FEED SO AS NOT TO INTERFERE WITH THE TOOL OF SPINDLE No. 2 WHICH IS ON THE SAME LEVEL
BORING TOOL
SPOT FACE TOOL
SUPPORT BUSHINGS
GUIDE BUSHINGS
DRILL
PILOT
PART—GEAR CASE
DRILLS
BORING TOOL

• Three 5 h.p. units designed in connection with heads on a machine built by customer who provided fixture and base for machining a case from 3 sides with electrical control so arranged that no interference of any one unit with any other can take place. The adjustable stop collars on the guide bars control depth of facing, holding uniformity. Center unit equipped with speed reducer to accommodate large facing cutter.

• Details of machining operation on cast iron gear case. Operation was set up so that spindles did not interfere even though they were on the same plane.

★ A single spindle, a double spindle, and a six spindle head for drilling, facing, boring, and reaming a cast iron gear case.

With these heads it required one minute to machine 9 holes ranging from 33/64" to 2½" in diameter. Once the case was put in the fixture no handling time was required.

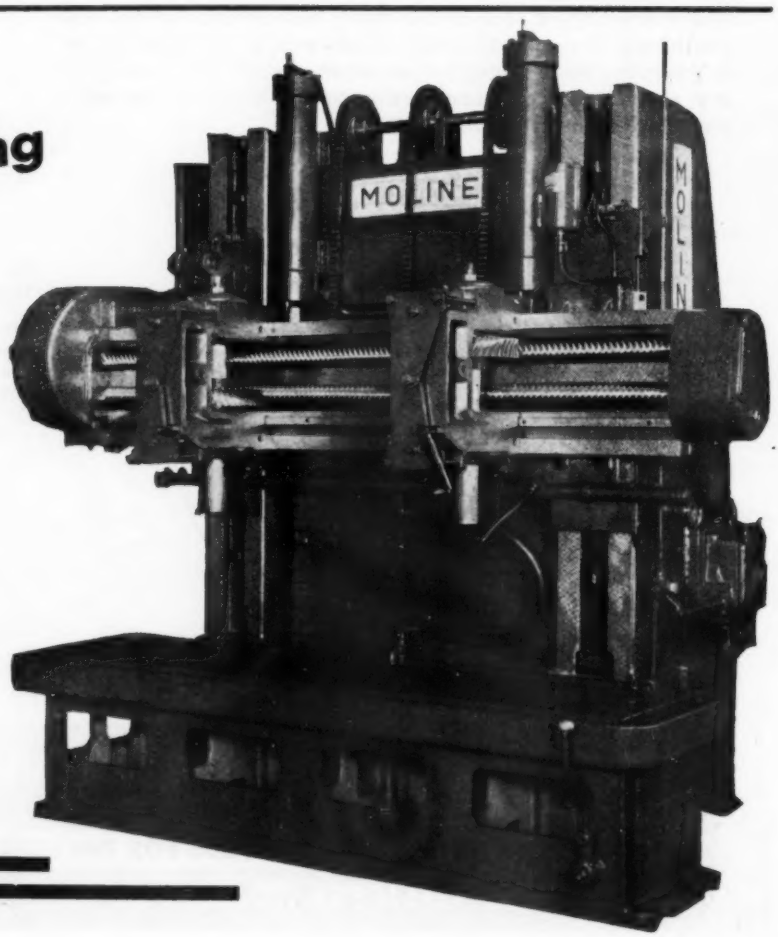
This combination of Hoefer Heads was designed to do a job formerly requiring special machines which at the time were not available. The design enabled machining time to be reduced to ⅛ the time formerly required for the same operation.

In planning your future machining and in figuring for lowest cost machine investment consult with us.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

"Hole Hog" or Nothing



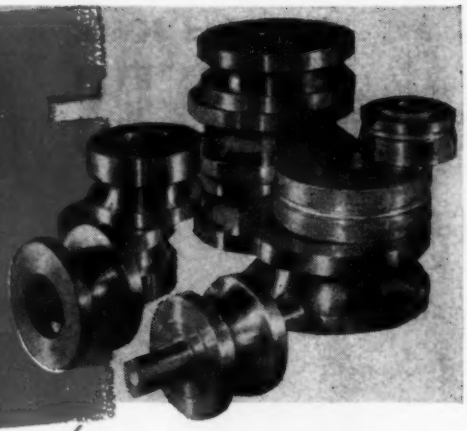
Farm implement makers, railroad shops, as well as manufacturers of road machinery and oil well equipment, have found that when they need to solve a tough drilling operation it's "Hole Hog" or nothing in getting faster production.

The HD68, pictured here, is built in various modifications for special drilling problems and for years of trouble-free operation where heavy duty work is the rule. Straight line or special out-of-line drilling can be done to advantage with heavy and rugged Moline hydraulic rail feed machines. Easily adjustable spindle center distance provides maximum adaptability to many different jobs.

A catalog bulletin is available showing the interesting variations of the Moline HD68 Driller for angle or vertical drilling. Specific recommendations to cover the application of this type machine to your own particular work will be furnished upon receipt of information describing your requirements.

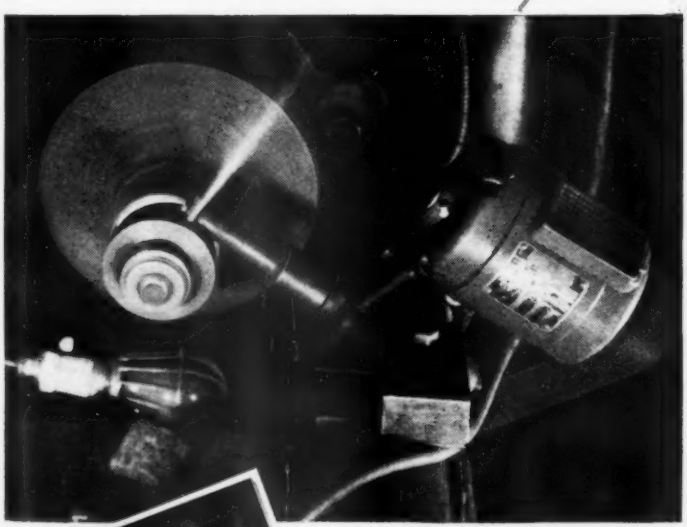
Write to MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

KEEPING TUBE ROLLS *True to Form*

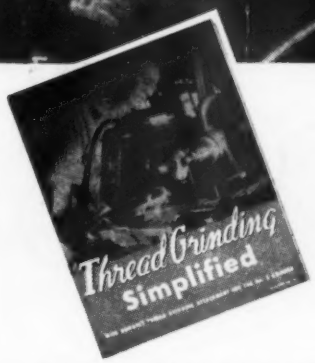


DEMONSTRATES THE ADAPTABILITY OF A DUMORE PRECISION GRINDER

Welded steel tubing produced by a certain midwest mill is used for various purposes necessitating precise and uniform outside diameter. The important job of maintaining the forming rolls in correct shape and accurate dimension is performed by a Dumore Precision Grinder. The axis of the quill is placed at right angles to the axis of the roll, by mounting the grinder on a specially devised bracket at the rear of the lathe.



The increasing use of the Dumore Precision Grinder on production operations is a natural result of its abundantly demonstrated adaptability as well as the high precision of its operation. Many unusual applications are illustrated in the Catalog 42. Send for a copy. The Dumore Company, Tool Division, Dept. TB-14, Racine, Wisconsin.



Thread Grinding is a special operation efficiently performed by the Dumore... This bulletin explains how. Send for copy today.

DUMORE

PRECISION AND OFF-HAND GRINDERS

Sold by authorized industrial distributors in all principal cities

W. F. and JOHN

BARNES 924 *Vertical*

DRILLING, BORING AND FACING MACHINE

A BASIC MACHINE THAT CAN BE TOOLED AND ADAPTED TO MANY TYPES OF HIGH PRODUCTION JOBS REQUIRING UP TO 60 H. P. AND 50,000 LB. THRUST

Machine for drilling 45 ¾"-holes in cast armor plate.

★ Design and construction features of this machine make it highly suitable for mass production drilling, boring, facing and reaming — especially on those jobs requiring wide-area heads. Unusually slow feeds are obtainable for heavy facing work by simple adjustment on the hydraulic unit mounted on the side of the column.

The heavy, cored column casting with 24" ways carries the head saddle and head which are counterbalanced by easily-accessible weights. The control bar with adjustable dogs for governing the head travel — and the way lubricator are mounted on the head saddle.

The illustrations below show how we have adapted the 924 Machine to a variety of high production jobs.

Write for additional information — ask for bulletin No. 245.

ILLUSTRATIONS BELOW

1. Twin-column machine for multiple drilling and reaming 72-¾" dia. steel plate. Arranged for index table.

2. Machine for rough and finish boring and turning rabbet on tank part.

3. 18-spindle 4-station machine with tapping unit — drills, reams, spotfaces, and taps tractor track links.

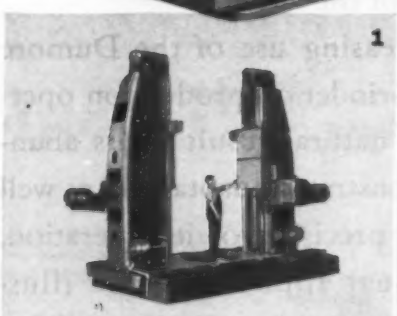
4. Boring and facing machine with dual-hydraulic head and 100" x 28" table. Will handle up to 30" facing operations.

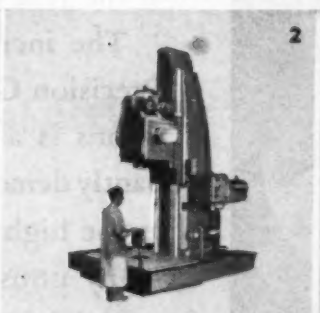
5. 3-station machine with 108" index table, rough and finish bores and faces rear axle housing.

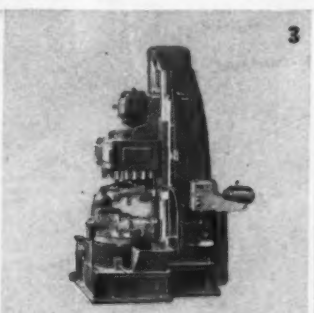
6. Armor plate tank differential carrier is finish faced and line bored on this machine.

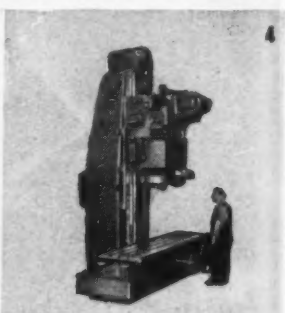
7. Machine for bump facing 22" dia. and rough boring steel tank part.

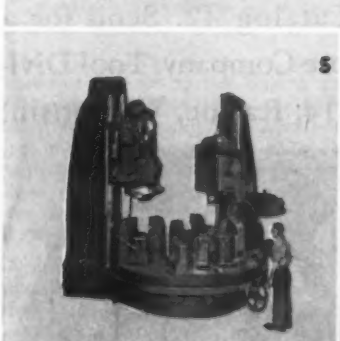
8. Machine for rough and finish boring, counterboring, back counterboring and chamfering sleeve seats in motor block.

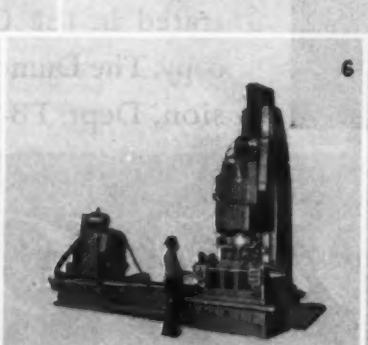


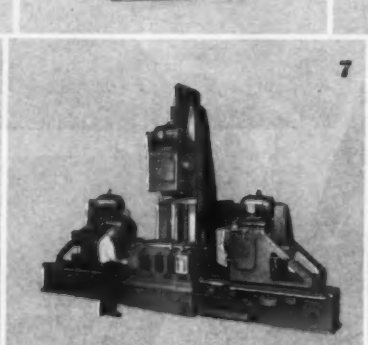












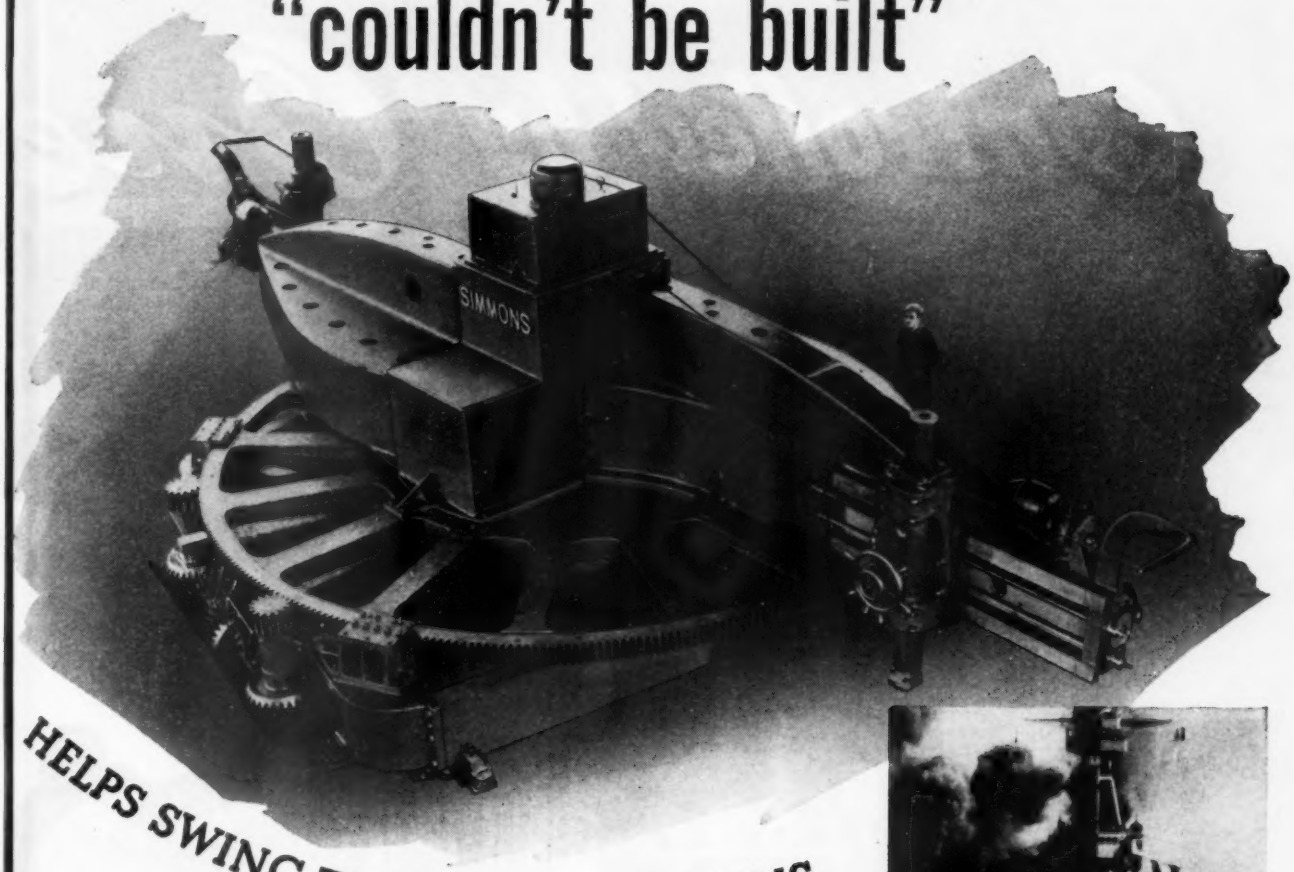
W.F.&JOHN BARNES

Special MACHINE TOOLS FOR DRILLING, REAMING, TAPPING, BORING, FACING, MILLING AND HONING OPERATIONS

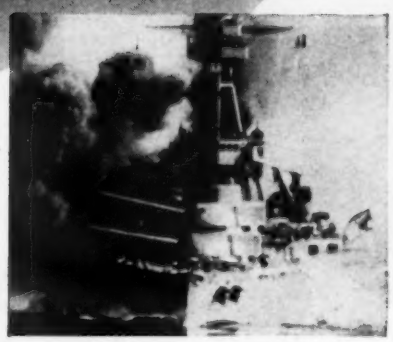
W. F. and JOHN BARNES

310 SOUTH WATER STREET. • ROCKFORD, ILLINOIS, U.S.A.

THE MACHINE TOOL THAT "couldn't be built"



HELPS SWING THE NAVY'S BIG GUNS



THE BIG GUNS of America's newest battleships swivel on forged turret rings as large as 33 feet in diameter. To machine the rings—which must be one-piece forgings because a welded ring might break from the recoil—the Camden Forge Company required a 36-foot boring mill. A conventional-type mill of this capacity would have taken at least a year to build. And the Navy program couldn't wait.

Simmons engineers, trouble-shooters of the metal-working industry, were called upon for help in solving the problem. They blueprinted this giant mill, unique in design and with a main drive gear 24′ in diameter and containing 348 teeth*...offered to custom-build it in thirteen weeks. Other machine tool builders shook their heads...said it couldn't be done in that time. Some even expressed doubt that the mill could do the job at all.

When the machine was produced—on schedule—it fully lived up to performance expectations and has been running twenty-four hours a day since!

The design and manufacture of special-purpose machine tools is an important phase of Simmons activities along with Engineered Rebuilding and modernizing on a service basis and the sale of used machine tools, rebuilt under Simmons' tested Engineered Rebuilding standards.

To familiarize yourself with this unusual company, write on your letterhead today for a copy of "The Simmons Way."

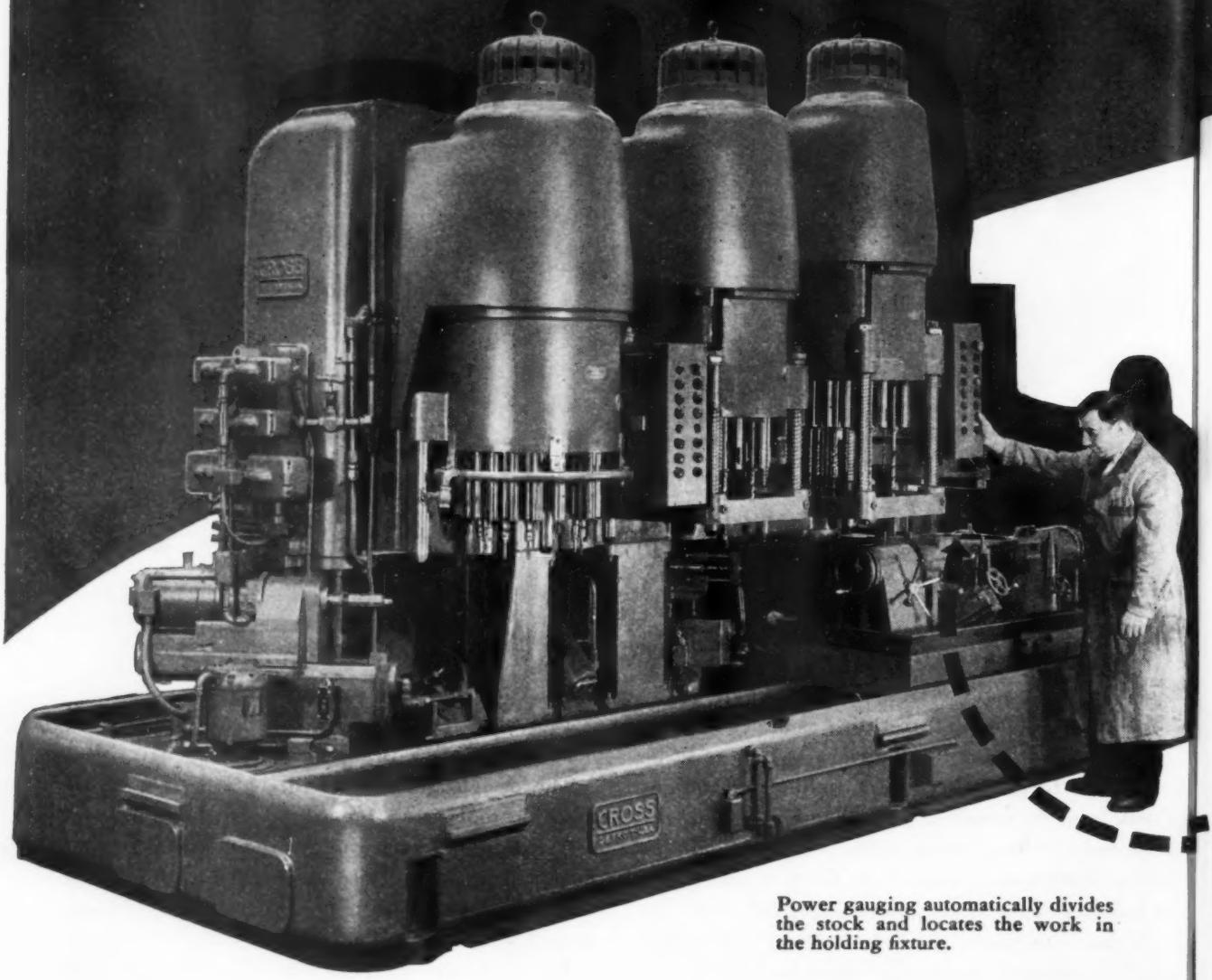
**During its construction Simmons engineers perfected a new precision method of indexing in the cutting of large-diameter gears. We will be glad to furnish complete details.*

SIMMONS MACHINE TOOL CORPORATION
1759 NORTH BROADWAY · ALBANY, N. Y.

MANUFACTURERS OF STANDARD AND SPECIAL-PURPOSE MACHINE TOOLS · ENGINEERED REBUILDING **SIMMONS**

MULTI-OPERATION MACHINE

Controlled by One



Power gauging automatically divides the stock and locates the work in the holding fixture.

CROSS

New York • Chicago • DETROIT • Cleveland • Dayton

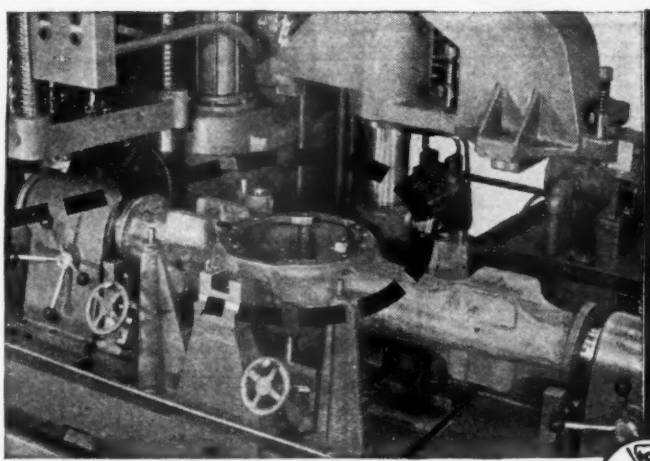
Operator . . .

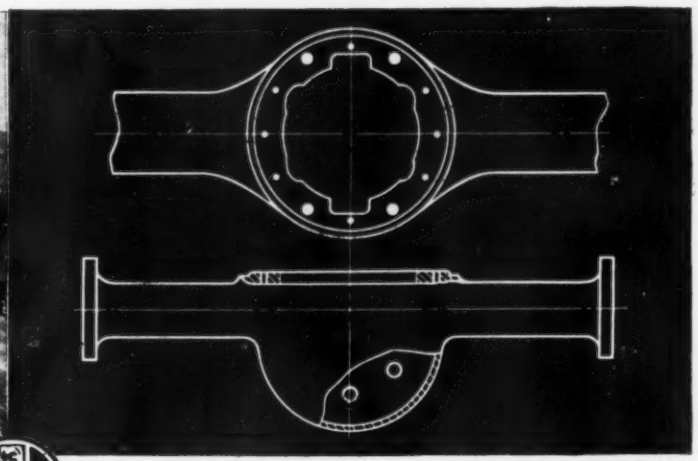
Precision Tolerances with *Unskilled* Labor

Progressive gauging, locating, drilling, countersinking and tapping operations are automatically performed with this Cross Transfer Type Processing Machine to finish 14 holes in three different planes in truck axle housings. Characteristic new features include: power gauging of the work to eliminate manual stock dividing with a height gauge to previous layout lines, automatic power indexing interlocked with precision locating of the work at each station, drilling and tapping of angular holes on the underside of the work simultaneous with overhead drilling of the flange holes, full electric push button control centralized for the operator's convenience.

One unskilled operator (female) and one Cross Processing Machine will do the work of ten skilled operators and ten standard machines with twelve unskilled helpers (male) for handling the work. Savings, through efficiency with existing manpower, are available to manufacturers using Cross Special Machinery for completing any one or a combination of turning, milling, drilling, boring, reaming, tapping, or grinding operations, at the push of a button.

Cross Engineering Service is available as a guide to cost reduction and improved use of manpower in your plant. A new Cross Catalog contains 35 detailed case histories of successful Cross Special Machines. For your copy, write on your letterhead to THE CROSS COMPANY, Detroit 7, Michigan, Department 91.





S-16

SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

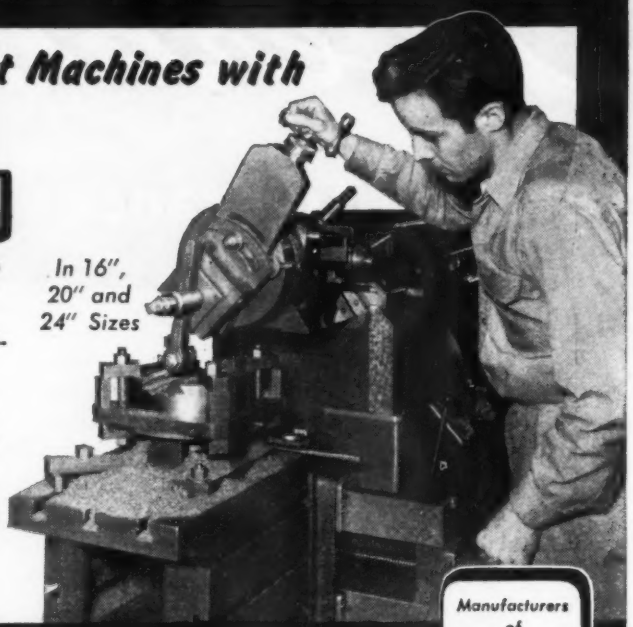
TIME TO TOOL for Post-War Production!

Replace Old, Worn-Out Machines with

GEMCO

Multi-Purpose SHAPERS

In 16", 20" and 24" Sizes



These features will help you produce better products—more speedily, accurately, economically:

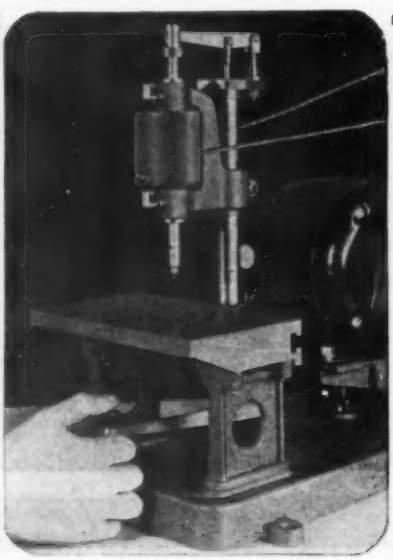
1—Sturdy, powerful construction; 2—Utmost precision in workmanship and performance; 3—Dependability under continued severe service; 4—Ease and convenience in operation; 5—Advanced type of force feed lubrication; 6—"LUBRIGARD" Safety Device increases the Precision Life.

Write Today for Bulletin GC-12A

GENERAL ENGINEERING & MFG. CO.
ST. LOUIS 4, MISSOURI

Manufacturers of **PRECISION MACHINERY** *Since 1917*

LORD & DAVIS SUPER-SENSITIVE HIGH SPEED DRILL PRESS



. . . for the most exacting **PRODUCTION NEEDS**

Speeds from 3,000 to 23,000 R.P.M.

The extreme sensitivity of this modern machine results in minimized breakage of extremely small drills as well as suitability for use under the most rigid precision requirements.

Proper surface speeds are attained by providing eight standard spindle speeds from 3,000 to 23,000 R.P.M. to cover all drill sizes from .004" to 1/16" diameter.

This machine is made with one, two, three or four spindles. On Multiple spindle units, each spindle may be run at an independent speed. Positive stops are available for all drilling spindles.

Write for Illustrated Bulletin, giving full details

MASSASOIT MACHINE CO.
220 GROVE ST., WALTHAM 54, MASS.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

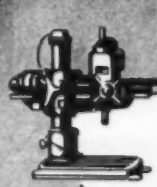
CLEVELAND
OHIO, U. S. A.

SMITH & MILLS CRANK SHAPERS

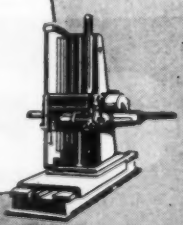
sizes 12" to 32" stroke

THE SMITH & MILLS CO. **Cincinnati, Ohio**

GILBERT



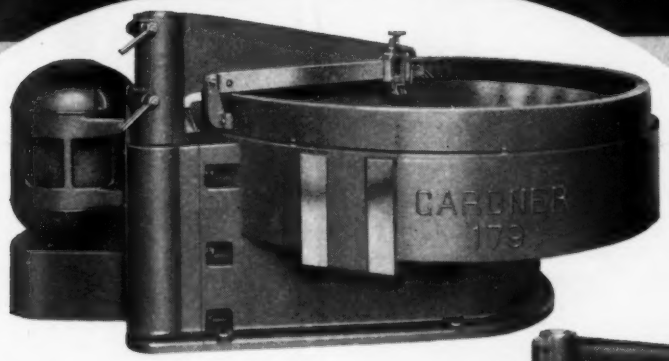
PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

Simplest method in the world *for* QUICKLY generating *flat surfaces!*



FOR over 30 years, Horizontal Disc Grinding has been, admittedly, the ideal method for quickly generating a good, flat surface upon a wide variety of parts, large and small.

There are 3 great advantages of this method:

1. High-production, due to quick, free-hand operation — NO FIXTURING NECESSARY.
2. Simplicity of operation, resulting in low labor cost.
3. Almost unlimited capacity — a 53" machine, for example, can handle small parts 2" square, and parts 30" long. Amazing versatility!

BUILT IN 5 SIZES — 18", 30", 36", 53" AND 72" WHEELS.

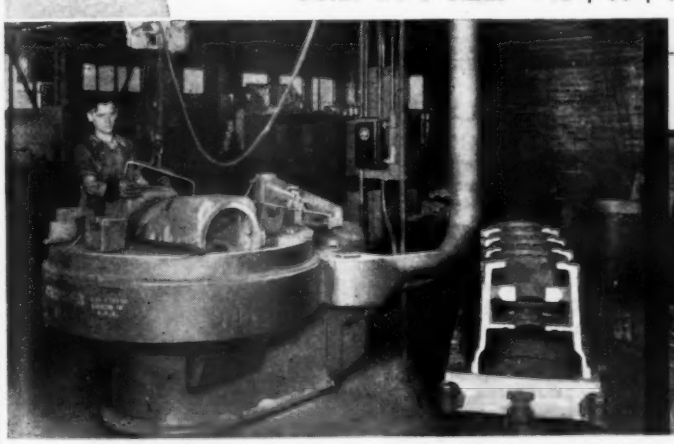


FIG. 1. A 53" machine grinds crank-cases for GRAY marine engines. Two parts are ground at one time, grinding by their own weight; operator just loads and unloads.

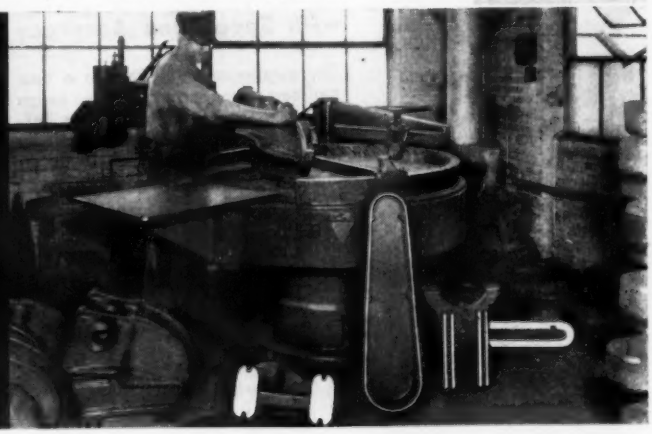


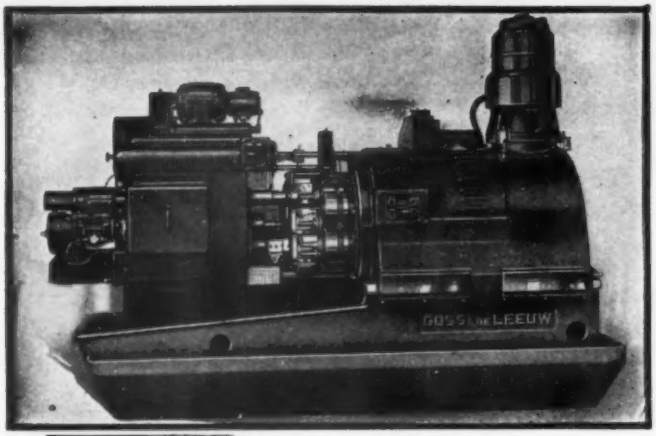
FIG. 2. Illustrating the versatility of a 53" Gardner Grinder. On the machine is a base for a small shear — on the floor, covers and slides for a well-known line of metal saws.

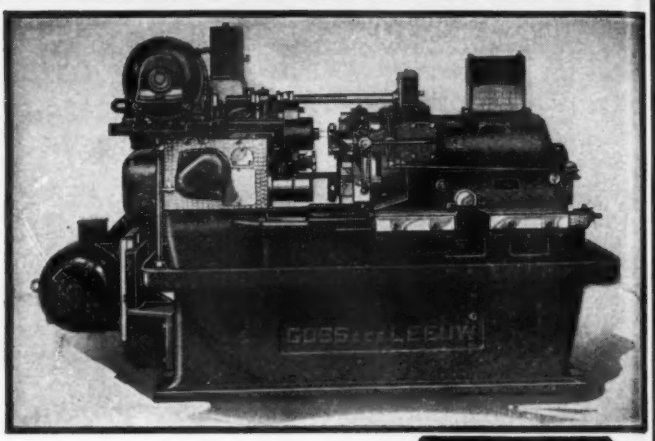
Write for our HORIZONTAL GRINDER BULLETINS!

GARDNER MACHINE COMPANY

410 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

---

for DIES, MODELS, PATTERNS, JIGS, MILLING, etc.

with Speed and Accuracy

The number of small jobs in a busy toolroom far surpasses the larger ones . . . a logical reason for having compact, high speed equipment like the LINLEY vertical MILLING and JIG BORING machine. It enables toolmakers to make fast set-ups, quick changeovers for speedier work, more jobs, in minimum time . . . and with the required accuracy.

FEATURES

- Eight spindle speeds, 275 to 4250 r.p.m.
- Direct micrometer setting.
- Backlash of quill travel eliminated.
- Grease-sealed bearings need no adjustment.
- Ample table size . . . 7"x17½".
- Table top to spindle end . . . 11½".
- Small floor space . . . 18½"x20".

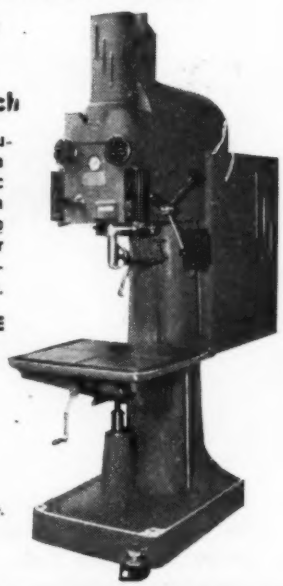
Simple in operation and set-up, yet a precision tool in the fullest sense. The Linley is a money-maker in any shop.

SEND FOR BULLETIN

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

CLEVELAND *Automatic Tapping Machine*

Model DB with Special Rapid Approach



- Here is a high speed, accurate tapping machine that can be operated 100% automatic or manually by the simple turn of a lever from *Automatic* to *Hand*. On automatic, operator merely loads and unloads machine after each tapping cycle.

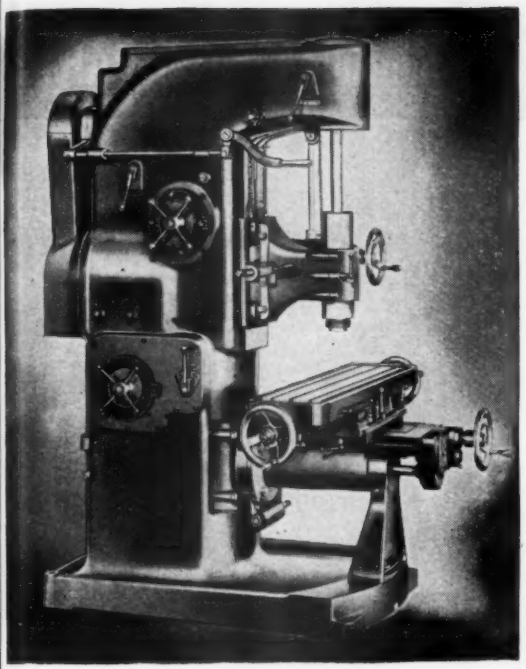
The Cleveland has FIVE Outstanding Advantages
Rapid Approach and Retract
Split Second Reverse
Lead Screw Controlled
100 Per Cent Automatic
Precision Depth Stop

Full descriptive bulletin available. Write for your copy today.

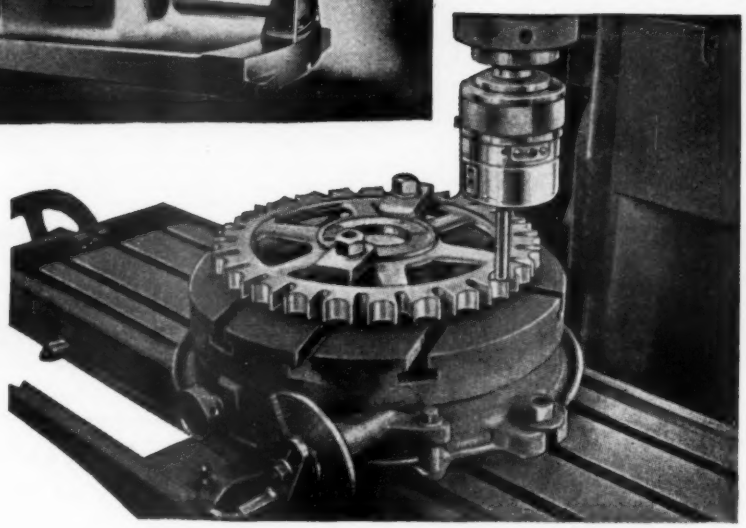
CLEVELAND
LEAD SCREW
TAPPING MACHINES

★

THE CLEVELAND TAPPING MACHINE CO.
1723 SUPERIOR AVE. · CLEVELAND 14, OHIO



THE VERSATILE ALL-PURPOSE KNIGHT Miller EQUIPS YOU FOR UNUSUAL CAPACITY



You get that all important "ACCURACY"

The geneva cam in this picture illustrates a typical job requiring accurate milling, boring, and spacing. The slots between the cam tracks held to be the same width and depth, the cam tracks all the same radius, and the spacing from center to center of each exactly the same. This was done quickly as well as accurately on a KNIGHT Miller equipped with indexing rotary table.

- ★ Speed and Accuracy for light milling
- ★ Power and Rigidity for heavy cuts
- ★ Difficult and Unusual Parts handled quickly and accurately without special equipment
- ★ Limited and Special Production done economically and quality maintained without special tooling
- ★ Internal and External Milling done at one setting

● The KNIGHT Miller's wide range of spindle feeds, solid table unit, ease of handling combine with other features to give you unusual capacity whether for light milling, heavy milling, or precision boring.

These milling machines will perform and produce at any of their speeds and feeds to the full capacity of the motor installed.

Capacity too is realized because of the short time necessary for making set-ups even though they are difficult ones. Additional setups in most cases are eliminated — some are greatly simplified.

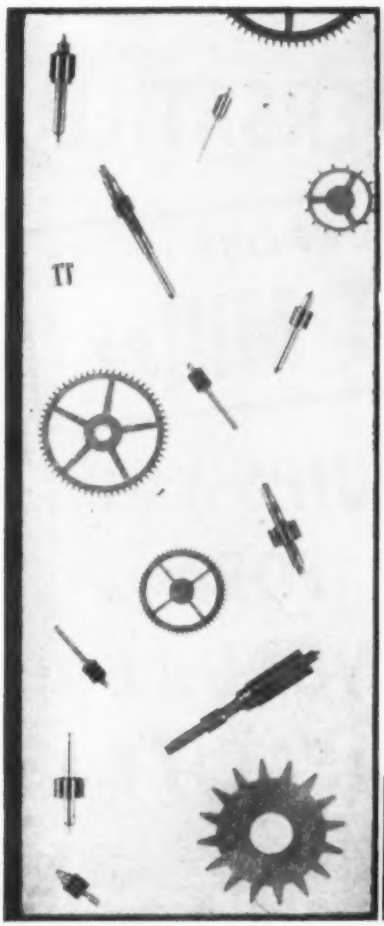
There is quick and accurate location of holes and surfaces—particularly so when dial indicators are used. To change vertical settings you simply move the spindle rather than the work. Added to all this is the fast method of changing cutting tools.

To get the full story on the fast, compact, complete, and convenient-to-handle KNIGHT Miller, write for catalog.

KNIGHT VERSATILE MILLERS ACCURATE RIGID

IMMEDIATE DELIVERY SUBJECT TO PRIOR ORDER

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •



for BIG SAVINGS in producing SMALL PARTS

WALTHAM
PINION and GEAR CUTTERS . . . .

High production with maintained accuracy is assured through the use of these fast, easily operated, compact, machines. Skilled labor is not required—an outstanding advantage today when experienced operators may not be available.

These machines—in single-cut, multiple-cut and magazine feed types—have a capacity for producing small gears and pinions in quantity for use in watches, instruments, gages, fuses, etc. where precision is of utmost importance. Fully automatic operation is realized on magazine-feed machines. Cutters are available for Waltham and other machines.

Write at once for full details.

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide: .40", .65", 1.00", 1.25"

SPECIFICATIONS

PINION MACHINES

Diameter capacity (approx.)—½"
Coarsest pitch (about) 32 D.P.
Strokes of work slide for pinions .25" to .45"
Strokes of work slide for stacked gears .85" to 1"
Bench space (countershaft drive) 19" x 18"
Bench space (motor drive) 26" x 25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

LEACH External Grinder

PRICE
$875.00
Fully Equipped

Write us today for your nearest dealer's name and address.

Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

Send for Descriptive Literature

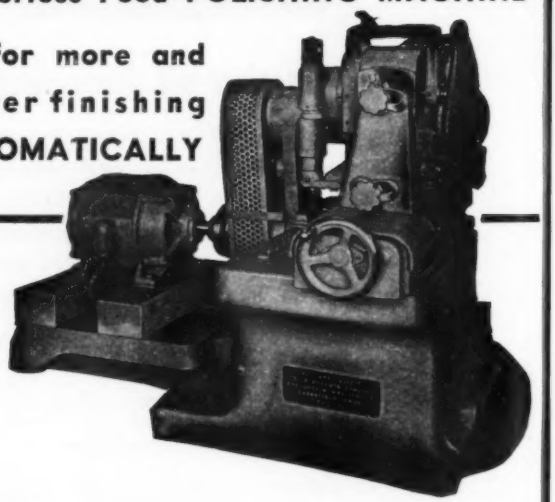
EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

No. 101 "PRODUCTION"
Centerless Feed POLISHING MACHINE

. . . for more and better finishing AUTOMATICALLY



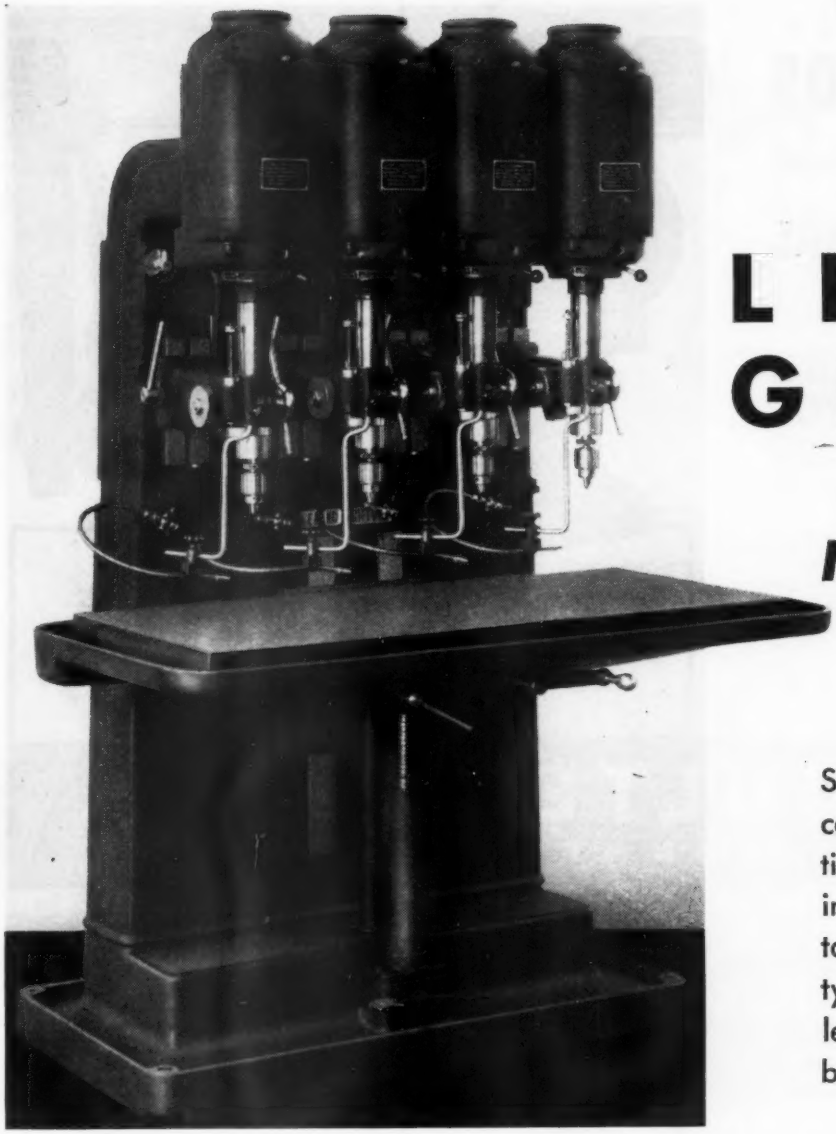
This new type machine assures faster work at lower cost. It is designed for polishing, finishing and buffing any cylindrical work to whatever degree of finish required.

Operation is extremely simple so that high quality work can be produced even with inexperienced help. Work is fed automatically—no centering, chucking or holding is required.

All parts are readily accessible; construction is sturdy; wheels from 10" to 16" diameter can be used; work support is adjustable to suit requirements; a suitable wheel truing device is provided.

Detailed specifications available promptly on request.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.



LELAND GIFFORD

Number One MOTOR SPINDLE DRILLING MACHINE

Strongly Constructed of unusual capacity but with particularly sensitive control — this machine is made in spindle combinations from one to six and in addition to the floor type machine illustrated in this bulletin, can also be furnished in the bench type.

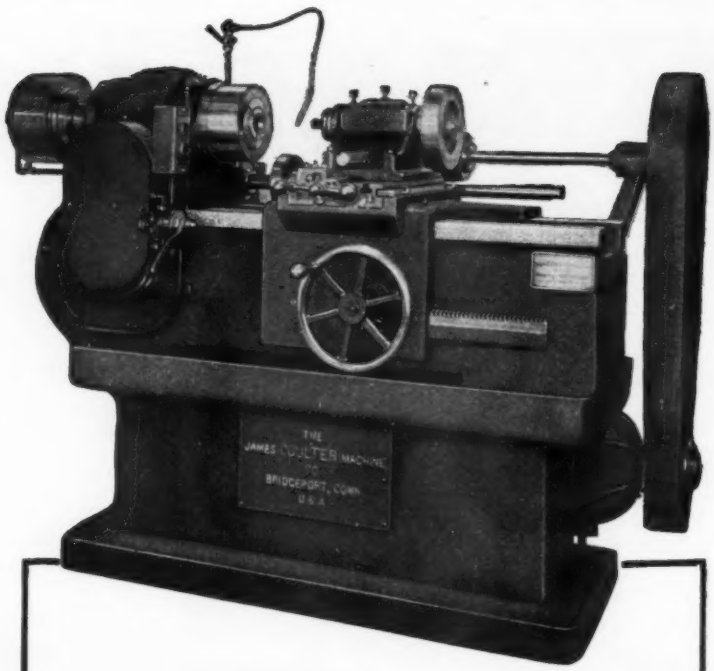
Built in Work Lights—Lots of Rigidity
Ratchet Type Feed Levers
Totally Enclosed, Fan Cooled,
Ball Bearing Motors . . . . . .
Preloaded Ball Bearing Spindles
Capacity—From No. 80 to 5/16 dia. drills in steel and 3/8 in cast iron.
Four or Eight Speeds up to 9000 R.P.M. *Instantly available.*

Ask for Bulletin No. 400 A.

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

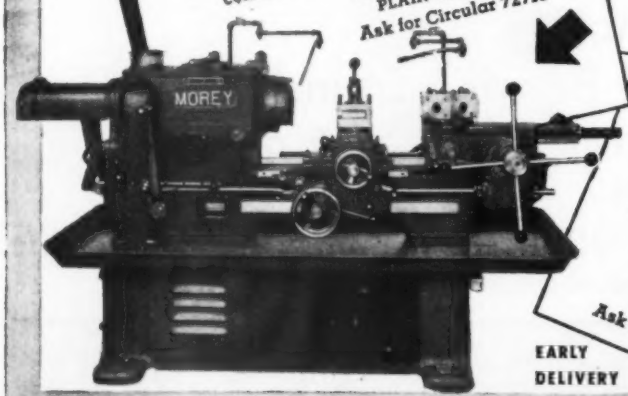
Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

MOREY TURRET LATHES
for BAR *or* CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

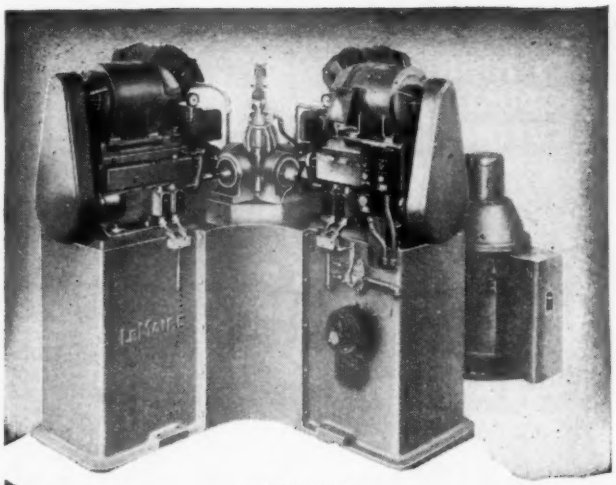
EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK



HOLLOW MILL

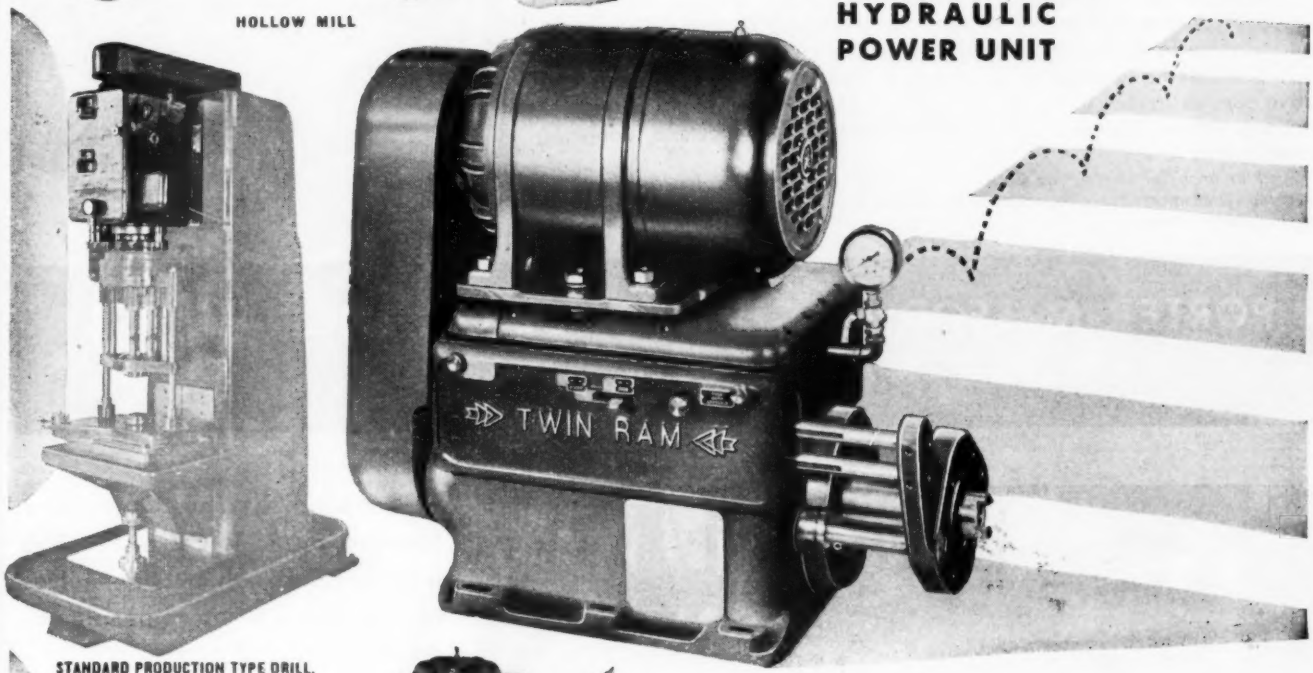
IT'S SIMPLE "To Make"

A MACHINE NOW

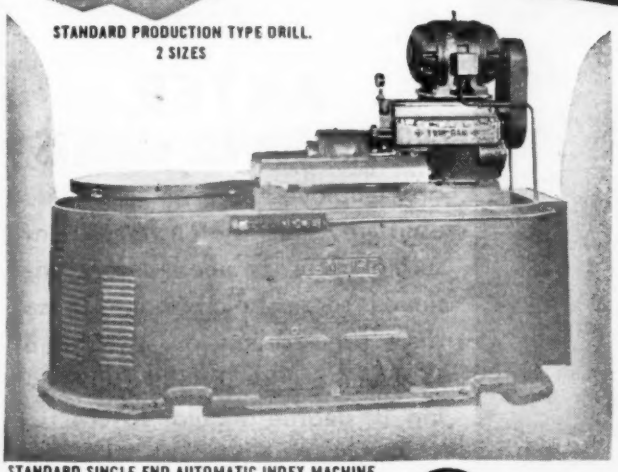
—if You Have a

TWIN RAM MASTER UNIT

A COMPLETE SELF-CONTAINED HYDRAULIC POWER UNIT



STANDARD PRODUCTION TYPE DRILL. 2 SIZES



STANDARD SINGLE END AUTOMATIC INDEX MACHINE

You can change this unit from one base to another, or rearrange your setup on the same bed, as your requirements dictate. It's practically as flexible as a motor; only pick-off gears necessary for speed changes—units provide infinite feeds. Twin Ram Unit can be used for wide range of applications—drilling (single or multiple spindle), reaming, milling, hollow milling, boring, counterboring, spotfacing. Uniform pressure behind load is always in a straight line—the two rams prevent twisting action. Two sizes available. Capacity up to 2" in steel. Can be made to operate manually or automatically by remote control—for either right or left hand operation—with spindle rotation in either direction.

Send for folder giving complete information—spindle speeds and feed rates.

We invite inquiries regarding postwar plans.

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD ▲ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

Save Time... Cut Costs

THE PORTER-McLEOD IS THE MACHINE FOR URGENT NEEDS IN HIGH PRODUCTION CUTTING

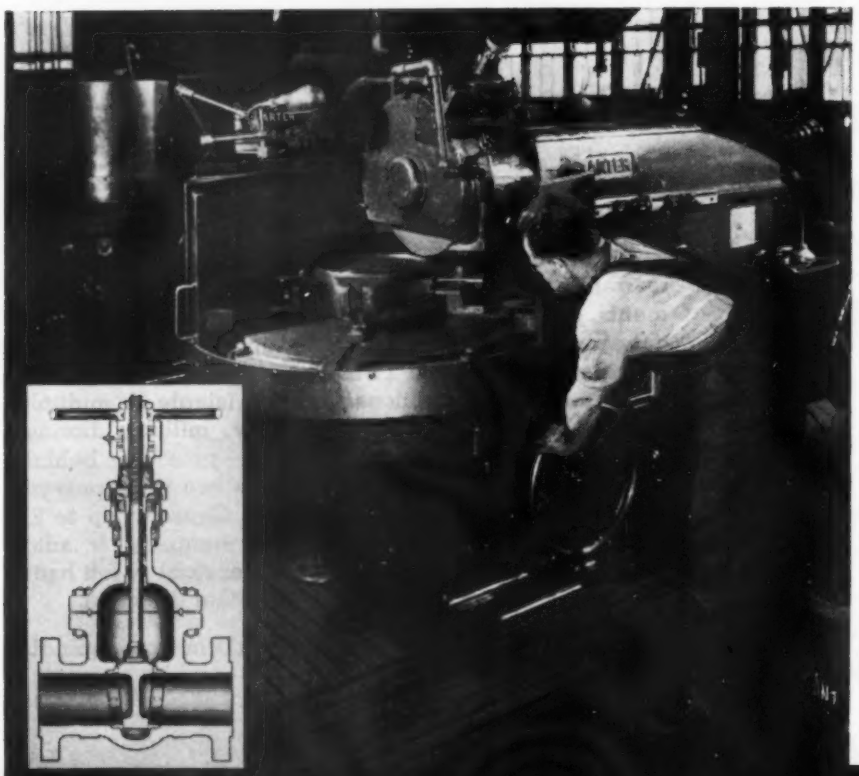
The 8" Porter-McLeod Cold Metal Sawing Machine provides a high speed, high production means of cutting stock from 3" up. Its capacity is 8" round and 7½" square stock. Provision is also made for the nesting of bars or shapes so that multiple units can be cut at one time.

Production can be stepped up tremendously by this machine because of unique features of design. For example, the blade is supported close to its rim and pulled through the cut. Buckling of saw is thus prevented and accuracy maintained. This method of support and drive assures longer blade life, straighter, cleaner cuts, faster cutting and less power. Blades are designed so that every tooth cuts, a further contribution to speed.

Send at once for Description Bulletin, giving full and complete details on this machine which meets every requirement for solving today's high production problems in cold metal sawing.

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U. S. A.



The name Crane Company founded by R. T. Crane in 1856 is known for high quality—valves and fittings as well as pipe, plumbing, heating and pumps.

ARTER

ROTARY SURFACE GRINDERS

are employed to grind the disc used in steel gate valves, insuring accuracy needed for continuous successful operation. These discs are ground on MODEL B ROTARY SURFACE GRINDERS using 10 degree angular fixture.

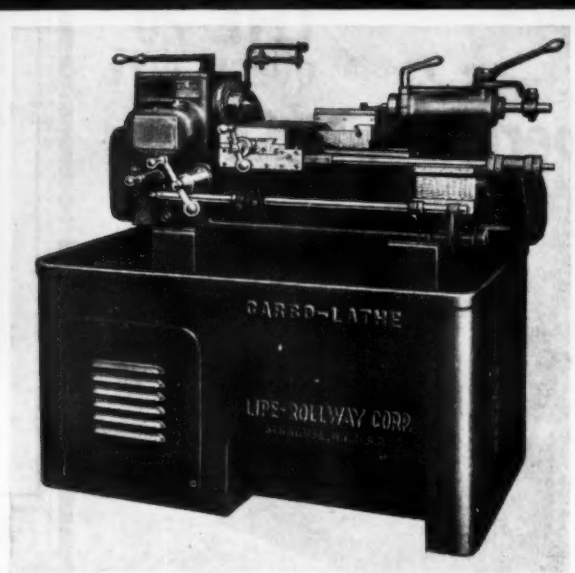
Another interesting ARTER grinding job — another example of ARTER versatility.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

"MY PRE-WAR LATHES ARE STILL MECHANICALLY EFFICIENT"

But



How Will They Stack Up Against

LIPE *Carbo*-Lathes

After the War ?

Sure your pre-war lathes are still mechanically efficient. But that's actually a draw-back. Because you'll be facing a New Order of competition after the war. And if you don't plan to retool with lathes like the LIPE CARBO—with lathes that embody the vast fund of engineering knowledge and experience that has been developed in wartime production—you'll pay an excessive cost in unnecessary operations, men and floor space, even in jigs, tools, inspections and scrap.

Engineered for Carbide Tools

LIPE CARBO-LATHE was especially designed for the Higher speeds and heavier cuts of carbide tools. Extreme rigidity, plus the smoothness of worm-gear drive, insure freedom from torsional deflections, taper and out-of-round. Combined with 162 speed changes, these advantages give long tool wear, longer runs between re-grinds and low tool breakage. Works to tolerances that would have been considered "tight" for toolroom jobs before the war. Cuts range from 0.003" to 0.30". Swing over bed 12", between centers 18". Let us send you complete data and delivery dates.

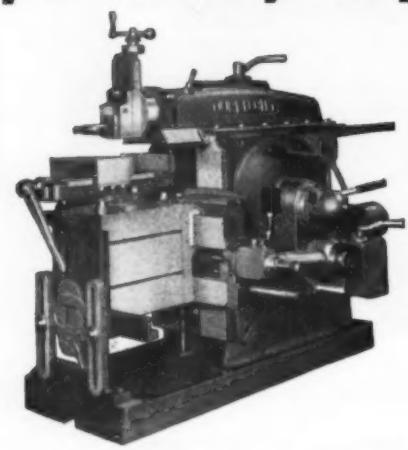
LIPE-ROLLWAY CORPORATION, SYRACUSE 1, N.Y.

A

NEW

More Efficient Shaper
20% LOWER IN PRICE

THE 20"
QUEEN CITY
Super Twenty Shaper



The new Queen City Super 20 Shaper offers advantages in price and performance no other Shaper of its type can equal.

A powerful, rugged machine, it is highly adaptable to both heavy production and a variety of tool room work. Many new operating features permit greater ease and convenience to improve quality while increasing production.

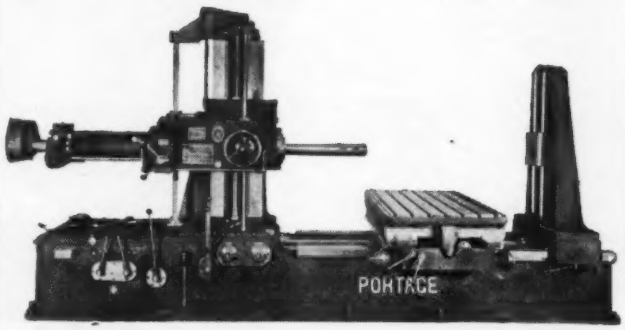
For top performance, speed, versatility, accuracy and unusual economy, the Super 20 will fulfill your highest requirements. Write for detailed literature.

The ram is of the V-type of wide bearing. Clutch is dry multiple-disc type. The feed range is extremely versatile—from .008" to .191", quickly and easily changed. A high torque motor for power rapid traverse is standard equipment. An electrical limit switch permits complete motor control. Timken bearings are used throughout.

Agents in Principal Cities

QUEEN CITY
MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

PORTAGE



NO. 4 HORIZONTAL BORING DRILLING & MILLING MACHINE

• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

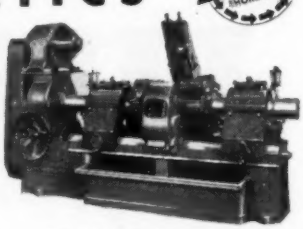
WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

Horizontal ROTO-MATICS

DAVIS and THOMPSON Roto-Matic

When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. ***Bulletins 110 and 120*** are available for suggested solutions to your problems.



No. 1-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

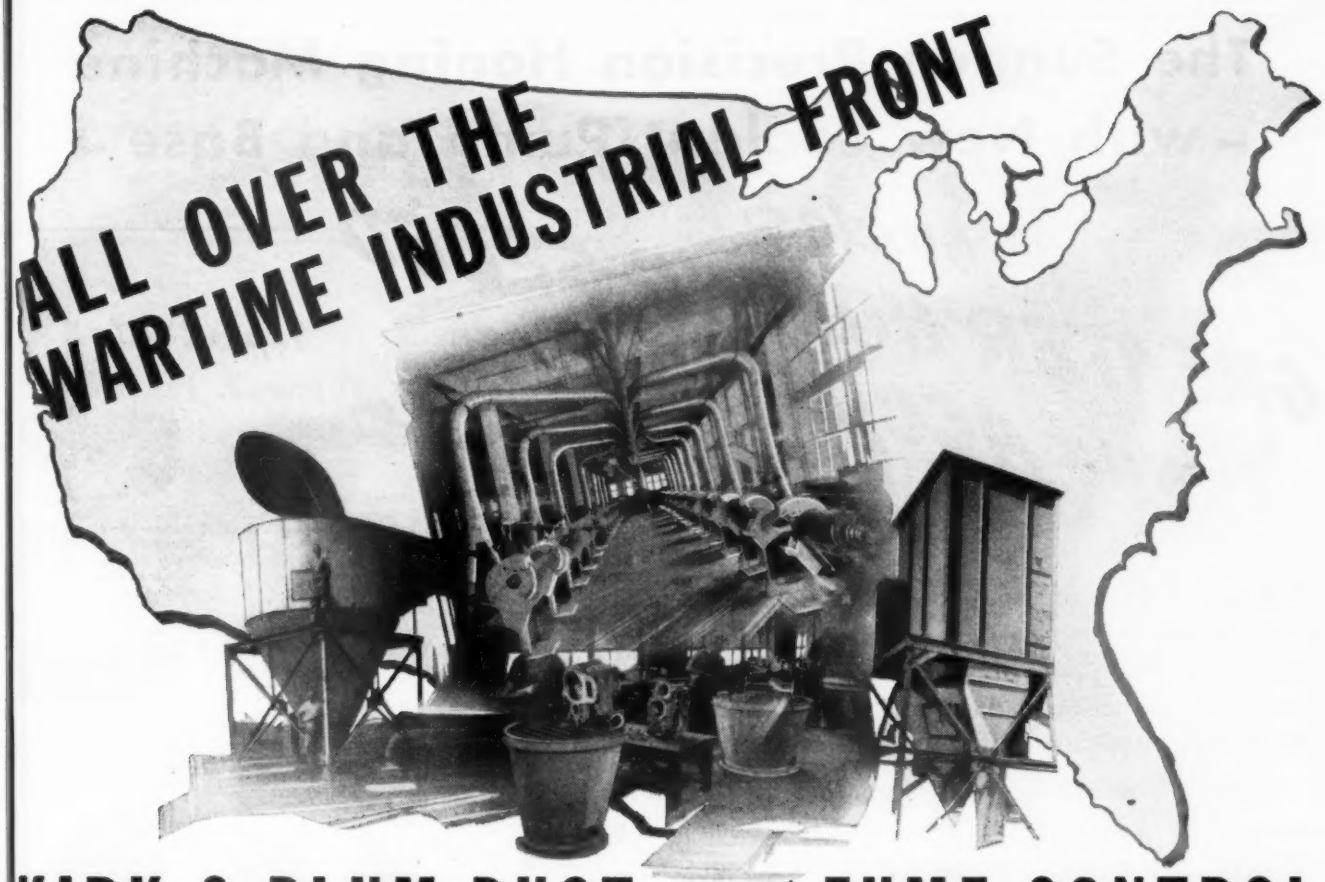
MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.



KIRK & BLUM DUST *and* FUME CONTROL

has Reduced ABSENTEEISM
Stepped-up PRODUCTION
Lowered COSTS

No—Kirk & Blum Dust and Fume Control Systems haven't "won the war." But in their own way, they have *helped*—helped materially—simply by doing the job for which they were intended. Effectively, dependably, they have removed and continue to remove harmful dust and fumes from the air of war plants and *all* types of plants the nation over.

By guarding the health of workers, by reducing absenteeism, increasing man-hours and man-efficiency, K & B *custom-engineered* dust and fume control systems have contributed in a very substantial way to plant economy and the meeting of tremendously increased production schedules.

SEND FOR BOOKLETS:

"Dust Collecting Systems in Metal Industries"

"Fan Systems for Various Industries"

"Blower Systems for Woodworking Plants"

"Industrial Ovens"

"Cooling Systems for the Glass Industry"

"Data on Kirk & Blum Production Facilities"

In both your present set-up and your plans for reconversion, it will pay you to turn *your* dust or fume control problems over to the Kirk & Blum staff of "air engineers"—*specialists* in this important field. Backed by Kirk & Blum's 37 years of experience, our engineers' unbiased counsel and expert planning is your best assurance of true economy and top performance. For further details write to

THE KIRK & BLUM MFG. COMPANY
2823 Spring Grove Ave., Cincinnati 25, Ohio

KIRK AND BLUM

The Sunnen Precision Honing Machine
– with New Coolant Pump and Base –

Provides GREATER HONING SPEED and ACCURACY

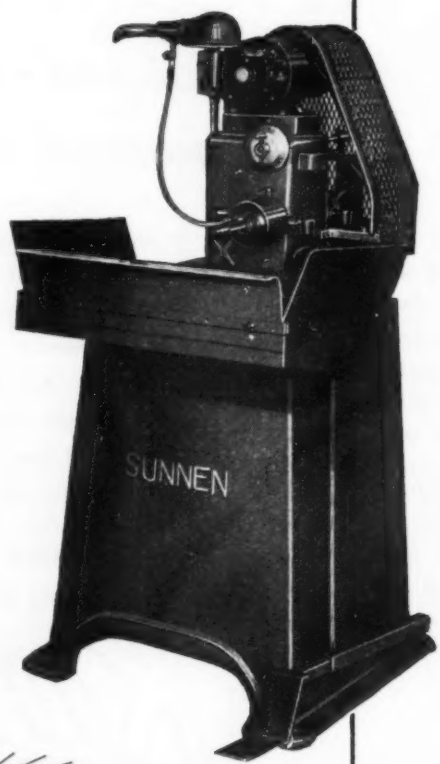
With the addition of a new base that contains a pump for supplying honing fluid, the Sunnen Precision Honing Machine is setting new standards of accuracy. Honing is faster, too. The honing fluid carries away all cuttings, keeps the abrasive stone sharp, and cools the part being honed.

With the Sunnen Precision Honing Machine, accuracy is guaranteed to be within .0001"— and has been held to .000025". A super-smooth finish can be produced. On certain types of metal, a finish of 2 to 3 micro inches can be obtained.

- **Hones and finishes cylinders from .185" to 2.625" in diameter**
- **Can be used in either ferrous or non-ferrous metals — plastics — ceramics, etc.**
- **Does not require skilled labor**
- **No jigs or fixtures needed**
- **Economical to operate**
- **Can be set up to operate in one minute**

Write for a free bulletin giving details about this low-cost honing machine — or ask a Sunnen engineer to show you how it can be used on your jobs.

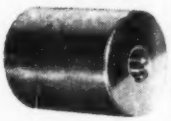
The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.



SUNNEN

Typical Jobs

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

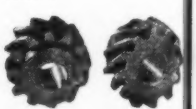
Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.



Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Bearing. A very small part 2 micro-inch finish necessary

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Shell Loading Die

Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

SUNNEN PRODUCTS COMPANY, 7941 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

Attention:

TOOL SUPERVISOR!

The accurate grinding of Single Point Tools is important to you. The economical answer is in —

THE OLIVER TEMPLATE TOOL BIT GRINDER

This machine grinds Single Point Tools with any combination of clearance angles and any reasonable shape or contour, with the assurance that every tool is an exact duplicate as to clearance and shape.

The machine is easily understood, and can be operated by a semi-skilled workman. Write for details!

- **ORIGINATED**
- **DEVELOPED**
- **PATENTED**

by **OLIVER OF ADRIAN**

(Pat. No. 2,231,217)

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.

1414 E. Maumee St. Adrian, Mich.

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS — TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS — DIEMAKING MACHINES

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—which I understand will help me to use Arc Welding to better advantage.

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—will put your imagination to work on the use of welding.
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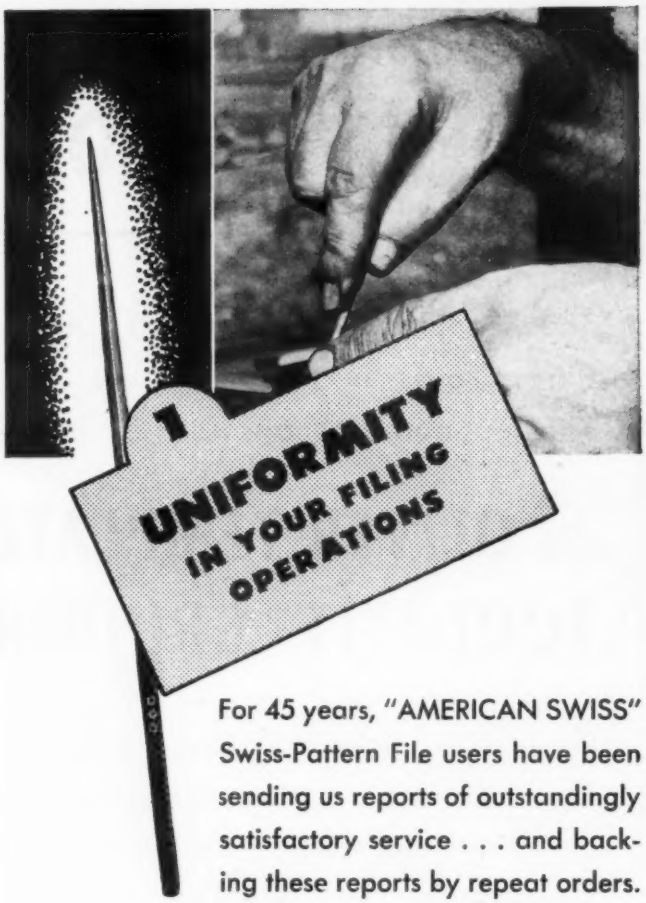
Now is the time to plan to use welding on your future production—to take advantage of experiences gained—to cut costs and yet build a better, stronger product. "Practical Design for Arc Welding" can help you plan. Ask for this service today.

HOBART Bros. Co.

Box AM. 2-15, Troy, Ohio, U.S.A.

One of the World's Largest Builders of Arc Welders



1
UNIFORMITY
IN YOUR FILING OPERATIONS

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For 45 years, "AMERICAN SWISS" Swiss-Pattern File users have been sending us reports of outstandingly satisfactory service . . . and backing these reports by repeat orders.

Here are some of their comments concerning "AMERICAN SWISS" uniformity . . . "Always uniform in temper" . . . "Can always depend on their uniformity" . . . "Uniformly satisfactory as to quality, life and cost."

It will pay YOU to standardize on the Swiss-Pattern files that win such commendation. Write for bulletin describing more than 3000 different shapes, cuts and sizes for every precision and intricate filing job.

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SWISS PATTERN FILES

ARE YOU

GETTING COMPARABLE SPEEDS ON LARGE SCALE MAINTENANCE THREADING?

IF NOT

GET AN OSTER

"WILCO"

OSTER "WILCO" PIPE THREADING SPEEDS!

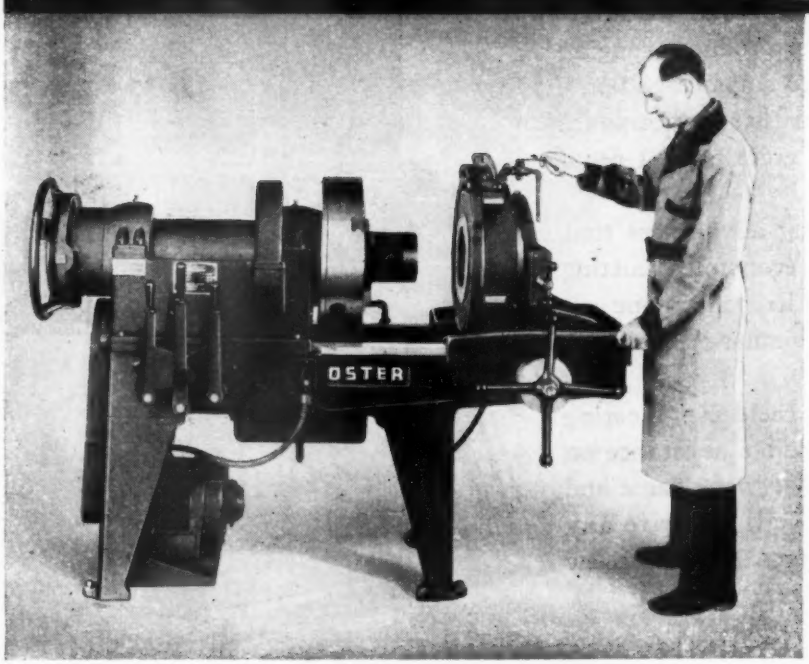
No. 704 "WILCO"

Pipe Size	*Threading Time*
1"	16 seconds
1¼"	16 seconds
1½"	24 seconds
2"	25 seconds
2½"	38 seconds
3"	40 seconds
3½"	56 seconds
4"	58 seconds

No. 706 "WILCO"

Pipe Size	*Threading Time*
1½"	19 seconds
2"	20 seconds
2½"	30 seconds
3"	31 seconds
3½"	48 seconds
4"	49 seconds
5"	70 seconds
6"	74 seconds

Note: Above time studies based on cutting full American National Standard pipe threads at recommended speeds.



Speed with accuracy equals low cost with safety! That's what the Oster "WILCO" Threading Machine is designed to do for YOU on YOUR maintenance threading of pipe and bolts.

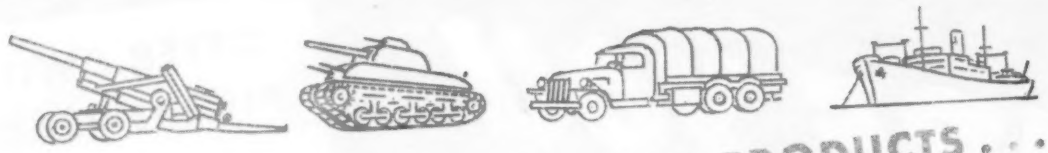
The "WILCO" Die-Head handles ALL sizes within range of each machine and one set of chasers threads all sizes of the same pitch without change. Movement of cam lever sets chasers to any size.

Chasers are *high speed steel* . . . small, economical, segmental type . . . held in massive steel holders for rigidity. One or more chasers replaceable without renewing entire set.

Other important features are illustrated and explained in CATALOG 10-A. *Write for a copy.*

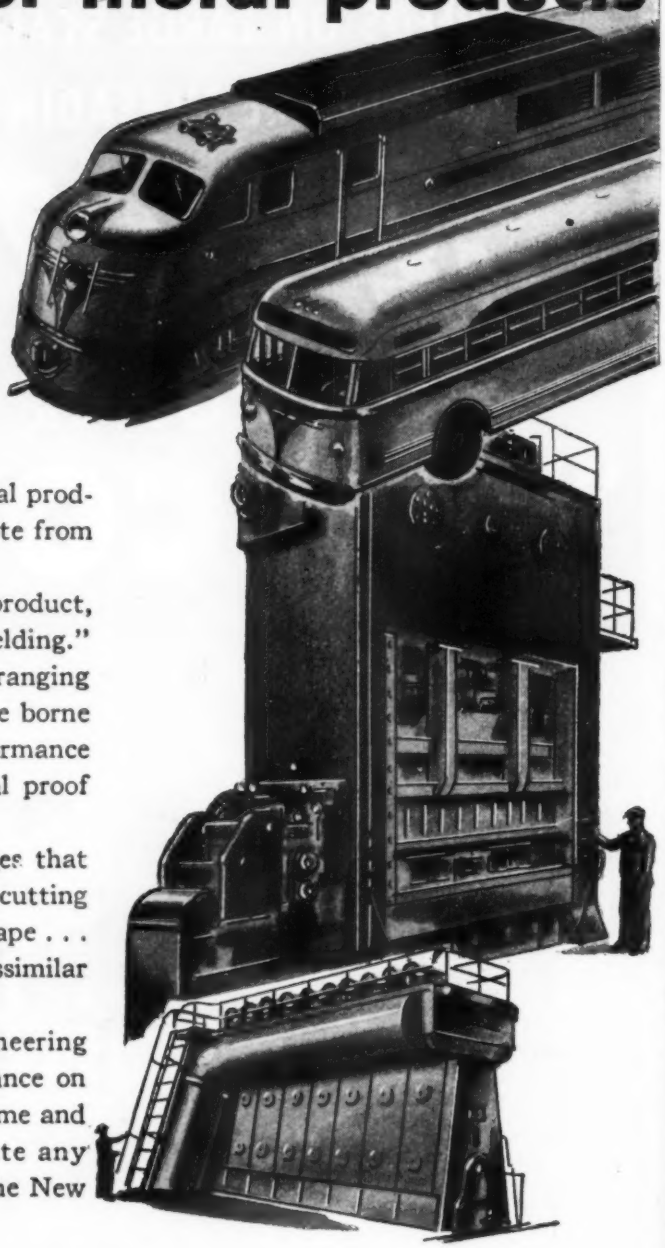
OSTER *for faster, better threading*

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.



LIKE THESE PROVEN WAR PRODUCTS . . .

Peacetime's better metal products will be FLAME-CUT and WELDED



DESIGNERS who are now planning peacetime metal products and machines will be wise to take this note from the war designer—

"For a stronger, lighter, better-looking metal product, design it for construction by flame-cutting and welding."

Hundreds of flame-cut and welded war products, ranging from tiny aircraft parts to massive cargo ships, have borne out the wisdom of this statement. And their performance in the tough proving ground of battle gives factual proof of their superiority.

Flame-cutting and welding offer many advantages that every designer should consider . . . fast, economical cutting of steel of any section into any regular or irregular shape . . . flexibility, speed and economy in joining similar or dissimilar metals into a strong, "one-piece" unit.

Representatives of Air Reduction's Field Engineering Division will be glad to give you all possible assistance on the use of the oxyacetylene flame and the electric arc. Call or write any Airco office or Dept. A.M. at the New York address.

★ BUY UNITED STATES WAR BONDS ★

AIRCO

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

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LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

Here's help on your rust prevention problems

STANORUST

IF YOU HAVE a problem of rust prevention on: stock in storage, parts in production, or complete machines to be shipped or stored during reconversion, you'll find the type of rust preventive you need in one of the 18 grades of Stanorust or government approved SR rust preventives in the Standard Oil line.

The grades of SR rust preventives and government specifications they meet are listed at the right.

The Stanorust line includes a wide range of products—from heavy grease for hot application to light product for spraying. Stanorust gives complete rust protection plus these advantages:

1. Easy application. Because Stanorust is available in grades for spraying, swabbing, or dipping, and for hot or cold application, you can choose a product that is easiest to apply under your present conditions.

2. No Waste. The wide choice of grades also makes it possible to apply the exact film needed to give the protection which the job requires.

3. Does not crack or peel. Stanorust does not harden or form a paint-like film which will be chipped off or damaged in handling.

4. Easily removed. Most grades of Stanorust can be removed by wiping the parts clean with a cloth dampened with petroleum solvent.

5. Acts as a lubricant. It is not necessary to remove Stanorust from parts that are to be assembled in a complete machine. Stanorust, itself, acts as a lubricant.

6. Light color.

7. Noninjurious to workers.

8. No unpleasant odor.

We can also supply these U. S. Government approved corrosion preventive compounds

SPECIFICATION NO.	DESCRIPTION	STANDARD OIL BRAND DESIGNATION
2-82C (Army)	Compound, Rust Preventive, Heavy	SR-4504
2-121 (Army)	Compound, Rust Preventive, Medium	SR-4445
2-84B Amend. 1 (Army)	Compound, Rust Preventive, Light	SR-5466
AXS-674 Rev. 2 (Army)	Oil, Lubricating Preservative, Medium	SR-5711
2-120 (Army)	Oil, Lubricating Preservative, Special	SR-5936
O.S. 1362 (Navy)	Oil, Lubricating Preservative, Light	SR-5939
O.S. 1363 (Navy)	Oil, Lubricating Preservative, Medium	SR-5942
AN-C-52a, Type II (Army-Navy)	Compound, Exterior Surface, Corrosion Preventive	SR-4323
AXS-934, Grade 1 (Army)	Oil, Engine, Preservative	SR-5799
AXS-934, Grade 2 (Army)	Oil, Engine, Preservative	SR-5749

★ ★ ★

Let a Standard Oil Engineer help you pick the grade or grades of Stanorust you need—and make a test. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

Gasoline Powers the Attack . . . Don't Waste a Drop!

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STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

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Profit by these war-developed products when reconverting

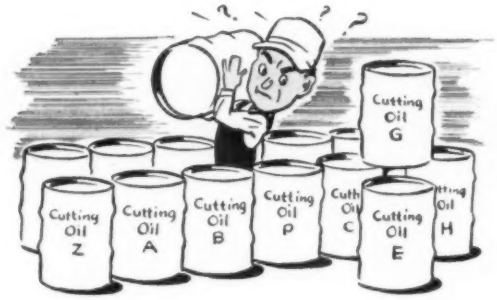
Stanicut
CUTTING OILS

The need for greater speed plus unusual accuracy and finish on many war products made the development of Stanicut Cutting Oils a necessity. They met the need. They've been tested and proved on all types of machining where sulfurized, chlorinated, or compounded cutting oils were needed.

Now these same oils are available to meet the demand for low cost machining in reconverting. A Standard Oil Engineer will be glad to study your cutting oil requirements, to help you reduce the brands and grades you stock and take advantage of the highly developed products, such as Stanicut, in your postwar plant.

Write the nearest local Standard Oil Company (Indiana) office, or 910 South Michigan Avenue, Chicago 80, Illinois, for a Cutting Oil Specialist.

War jobs that suggest peacetime applications



Eliminate the need for adding another cutting oil. Two new threading machines were recently received in the production department of a Chicago plant. Recommendations called for a specific cutting oil—a new one to the plant—another oil to add to the already complicated list of cutting fluids stocked. A Standard Cutting Oil Engineer was called in. "Would one of the oils already in use do the job?" he was asked. Analysis showed that one of them—Stanicut 155 CS—was similar to the recommended oil. It was tried. Stanicut 155 CS not only eliminated the need for another oil, but gave satisfactory performance on all jobs.

Tried Stanicut on one job . . . now whole plant uses it. A Missouri plant used a specially compounded cutting oil for threading a 3-inch collar. Although good results were being obtained, it agreed to test Stanicut 309 BCS on this one job, at the request of a Standard Cutting Oil Engineer. Today the whole plant uses Stanicut 309 BCS—and for three reasons: the test showed they got better tool life, a 50% increase in production, and lower cutting oil costs.

And again a gain. Another Missouri plant tested Stanicut 309 BCS on broaching, which replaced a base oil mixture. It also got better finish and doubled output of broached parts per shift. Two oils now fill the needs of this plant—Stanicut 309 BCS and Paraffin Oil for cutting back, where it is needed.

Gasoline Powers the Attack . . . Don't Waste a Drop!

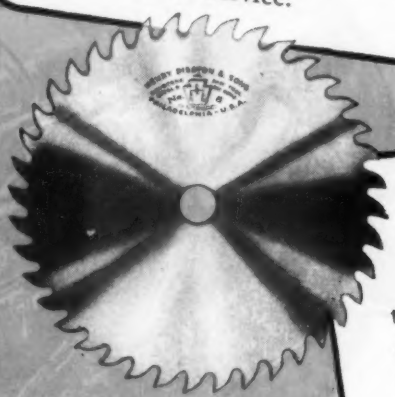
STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

★ LUBRICATION ENGINEERING

How a DISSTONEER solved the case of the SYNTHETIC CAMPHOR

A manufacturer of synthetic camphor was using band saws to cut this material. The saws were not cutting very well and were breaking after eight hours of service.



A Disstoneer* was called in to make recommendations. He found, after careful study, that band saws were not the correct type of saw for the job. Then he experimented with various types of circular saws, until he found the right type for this particular job. Now this plant is cutting *nine* pieces at a time instead of five; production is much faster and there is no more breakage of saws. Furthermore, their synthetic camphor is being cut smoother than ever before.

Another clear-cut case of Disston leadership!

*DISSTONEER — a man who combines the leadership and experience of Disston with sound engineering knowledge, to find the *right tool* for you—to cut metal, to cut wood and other materials—and TO CUT YOUR COST OF PRODUCTION!

Whatever the cutting problem, there is a Disston saw, tool, file or knife that will solve it. If you need highly efficient files, consider—

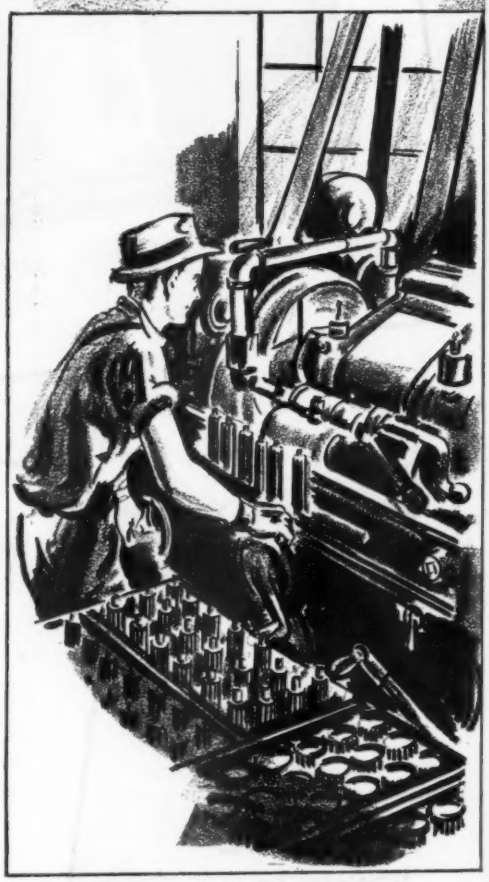
DISSTON BITE-RITE FILES . . .

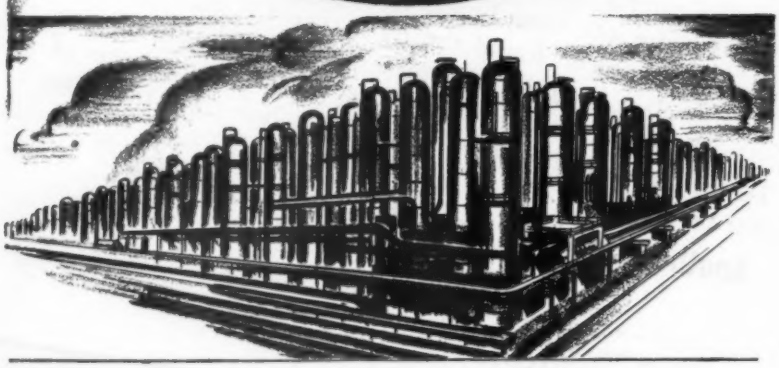
An extensive line of fine quality files that includes all commonly used patterns and sizes, each with clean, strong, sharp teeth cut at correct angles, and uniform in width and depth. Made by file specialists, backed by 80 years of file-making experience. Write for full particulars.

HENRY DISSTON & SONS, INC., 220 Tacony, Philadelphia 35, Pa., U. S. A.

Do you know that . . .

SINCLAIR PRODUCING OIL WELLS IF PLACED END UNDER END WOULD REACH TO THE CENTER OF THE EARTH—MORE THAN 3,500 MILES. SINCLAIR RANKS AMONG THE LARGEST PRODUCERS OF CRUDE OIL.





SINCLAIR'S 10 GREAT REFINERIES, IF MASSED TOGETHER, WOULD COVER AN AREA OF 2,300 ACRES —THE APPROXIMATE AREA OF A CITY OF 100,000 POPULATION. THESE REFINERIES MANUFACTURE A FULL LINE OF QUALITY PETROLEUM PRODUCTS FOR ALL MILITARY, INDUSTRIAL AND GENERAL USES.

FOR BETTER LUBRICATION OF MACHINING EQUIPMENT, SINCLAIR PRODUCES A WIDE RANGE OF SPECIALIZED HYDRAULIC, SPINDLE, GEAR AND GENERAL PURPOSE OILS . . . ALSO A DIVERSIFIED LINE OF CUTTING OILS ADAPTED TO EVERY MACHINING PROBLEM.

SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Guide

YOU will find frequent occasions to use this PM Gage and Small Tool Catalog—with its complete information about PM Diamond Emblem Gages—for accurate and precise production control.

Also described are many types of small cutting tools—built to form metal in accord with today's accurate dimensional standards and close tolerances.

The PM Diamond Emblem on all of these gages and tools is your guarantee of initial accuracy and extra care used in finishing and hardening.

If you have not already received your copy of the new catalog, a request on your company letterhead will bring one to you.

PM CO

The PIPE MACHINERY COMPANY Cleveland, O.

AMES No. 12

Caliper Gauge

Measures accurately wall thickness of tubing, diameters of shafts and odd-shaped parts, thickness of sheet metal and other materials.

Large pointer makes one complete revolution for each inch of jaw opening. Small pointer shows number of turns made by large pointer — or a total of 5 inches — jaw depth is 8 inches. Jaws close by spring tension.

All outside parts chromium-plated or made from stainless steel. No exposed gears. Accurate, durable and dependable.

New Catalog — No. 53
Send for your copy.

B. C. AMES CO. • WALTHAM, MASS., U. S. A.

Branch Offices: 917 New Center Bldg., Detroit 2, Mich., • 420 Lexington Ave., New York, 17, N. Y.

Do it with DALZEN

Left: Dalzen taps, in U. S., Metric, Whitworth, and Special forms are precision ground of hardened high speed steel in a complete size range. TUNGSTEN CARBIDE TAPS — EITHER SOLID OR INSERT—A SPECIALTY.

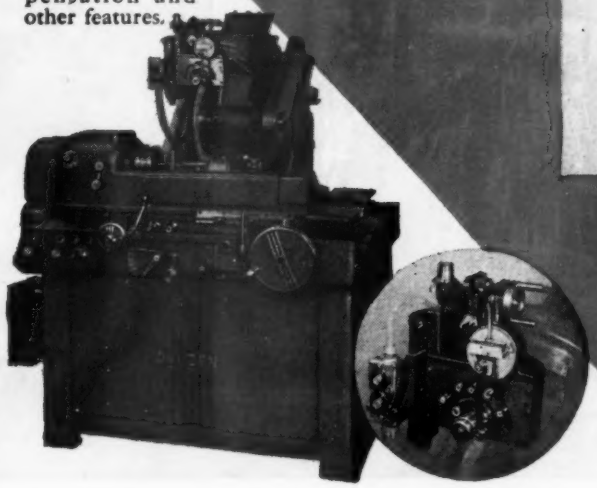
Left: High speed ground thread milling cutters, scientifically heat treated for longer cutting life

Dalzen manufactures an extensive line of precision cutting tools, parts, thread grinding and special machines — engineered for maximum efficiency and economical operation. Each is the result of years of experience on the part of designers and craftsmen. These are reasons why, all over the United States and in many foreign countries, master mechanics who have used and worked with Dalzen-made machines and tools say, "You can do it better with Dalzen." Write for details on how Dalzen can "do it better" for you.

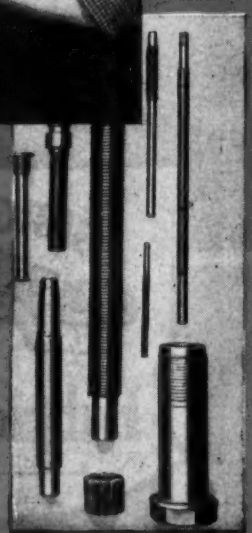
Below: Dalzen "2-in-1" combines a dependable, accurate center lapping machine with a sturdy drill press. Saves on equipment costs, floor space.

Below: No. 5 *Electronic* Thread Grinder. Easy to operate. High production efficiency and accuracy by controlled wheel speed, motor driven dresser, automatic compensation and other features.

Right: No. 2 Thread Grinder. Compact, upright design saves floor space. Simple to operate. Low first and maintenance cost. Ideal for short or production runs.



Right: Threaded parts are ground to close tolerances exactly to your specifications. Rigid inspection standards assure a uniform fine finish. Jobs requiring rolled or cut threads are also handled.

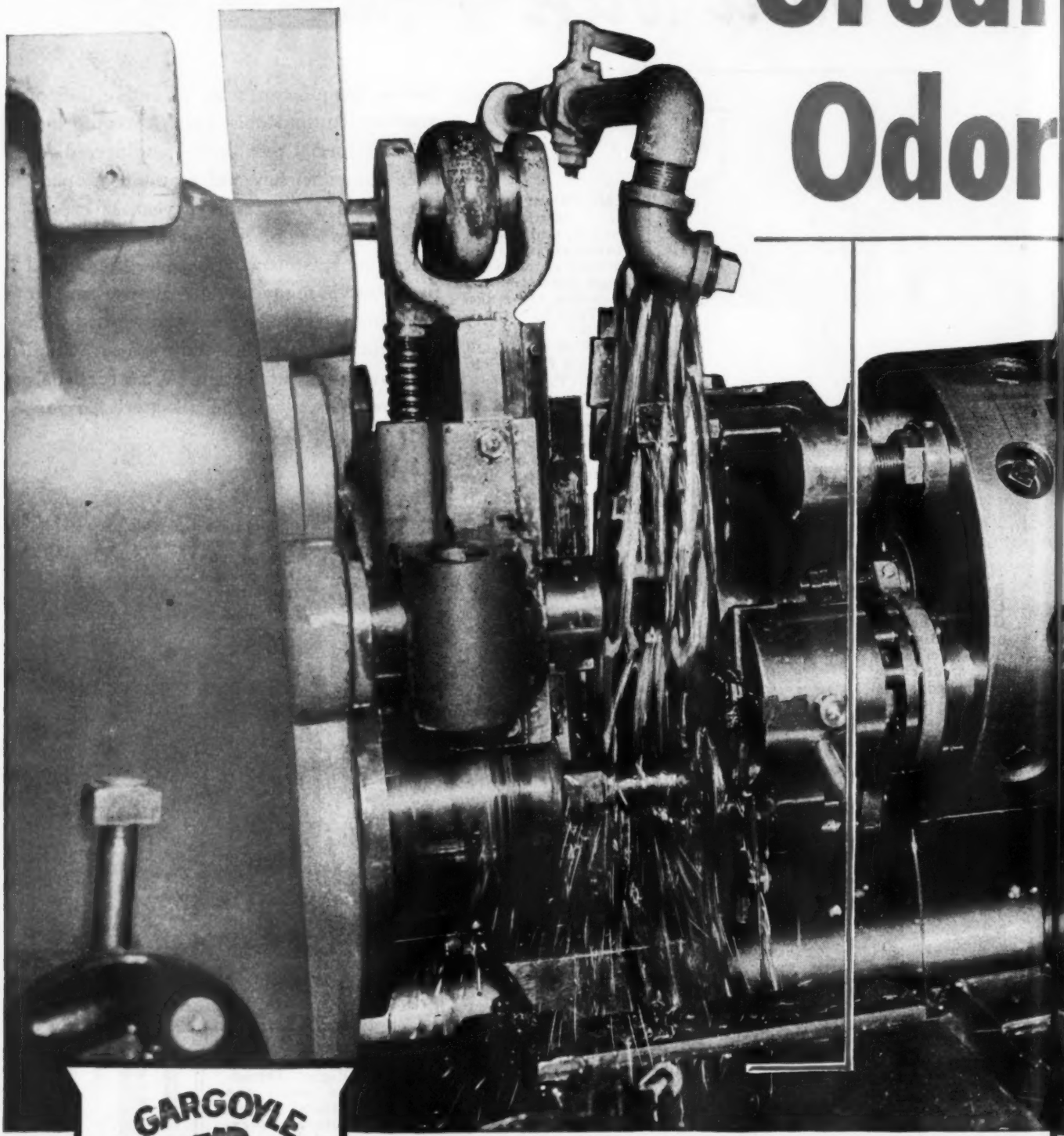


DALZEN

TOOL AND MANUFACTURING CO.

12255 EAST EIGHT MILE ROAD • DETROIT 5, MICH.

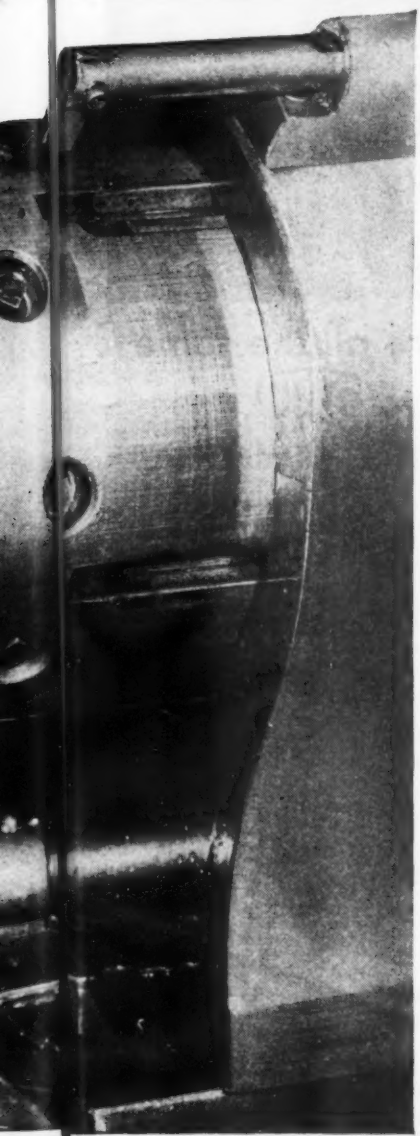
SOCONY-VACUUM ANNOUNCES Great Odor



GARGOYLE Lubricants

SOCONY-VACUUM'S FIVE STEPS TO LOWER PRODUCTION COSTS

New Transparent less Cutting Oils!



NEW S/V SULTRANS ALREADY PERMITTING GREATER PRODUCTION, LONGER TOOL LIFE AND IMPROVED FINISH ON MORE OPERATIONS THAN PREVIOUS OILS!

ANTICIPATING current metal-cutting needs, Socony-Vacuum has developed, and is now announcing, a new line of light-colored, transparent, odorless cutting oils.

These oils, the new S/V Sultrans, have already proved their superiority over other cutting oils in exhaustive field tests, and are now in service on many operations.

See the Work Better!

In addition to better visibility of the work, and no odor to cling to operators' clothing, the new oils also provide:

Outstanding lubricity for greater protection to the boundary area of cutting tools; *less sensitivity* to changes in the hardness and structure of metals and speeds and feeds of cut, permitting *wider application*; *improved drainability* for lower consumption; and generally all-around *better performance* for longer tool life and improved finish.

Available Right Now!

All of these improvements have been added without sacrificing any of the anti-weld and pressure resistance characteristics of previous Socony-Vacuum cutting oils.

The new S/V Sultrans are available now for your cutting operations. Ask your Socony-Vacuum representative for further details.

SOCONY-VACUUM OIL COMPANY, INC., Standard Oil of New York Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California.

1. Lubrication Study of Your Entire Plant
2. Lubrication Schedules and Controls
3. Lubricant Storage and Handling System
4. Skilled Engineering Counsel
5. Progress Reports of Benefits Secured

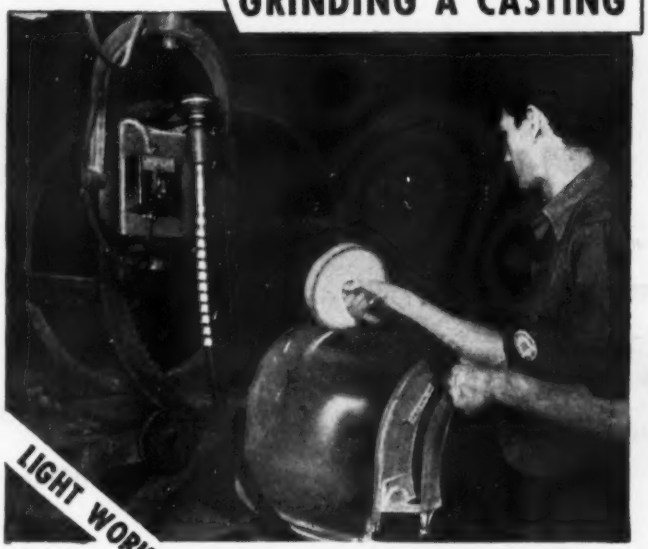
CRITERION *Boring Heads*

TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

CRITERION
MACHINE WORKS
BEVERLY HILLS CALIFORNIA

FROM BUFFING A FINISH *to* GRINDING A CASTING



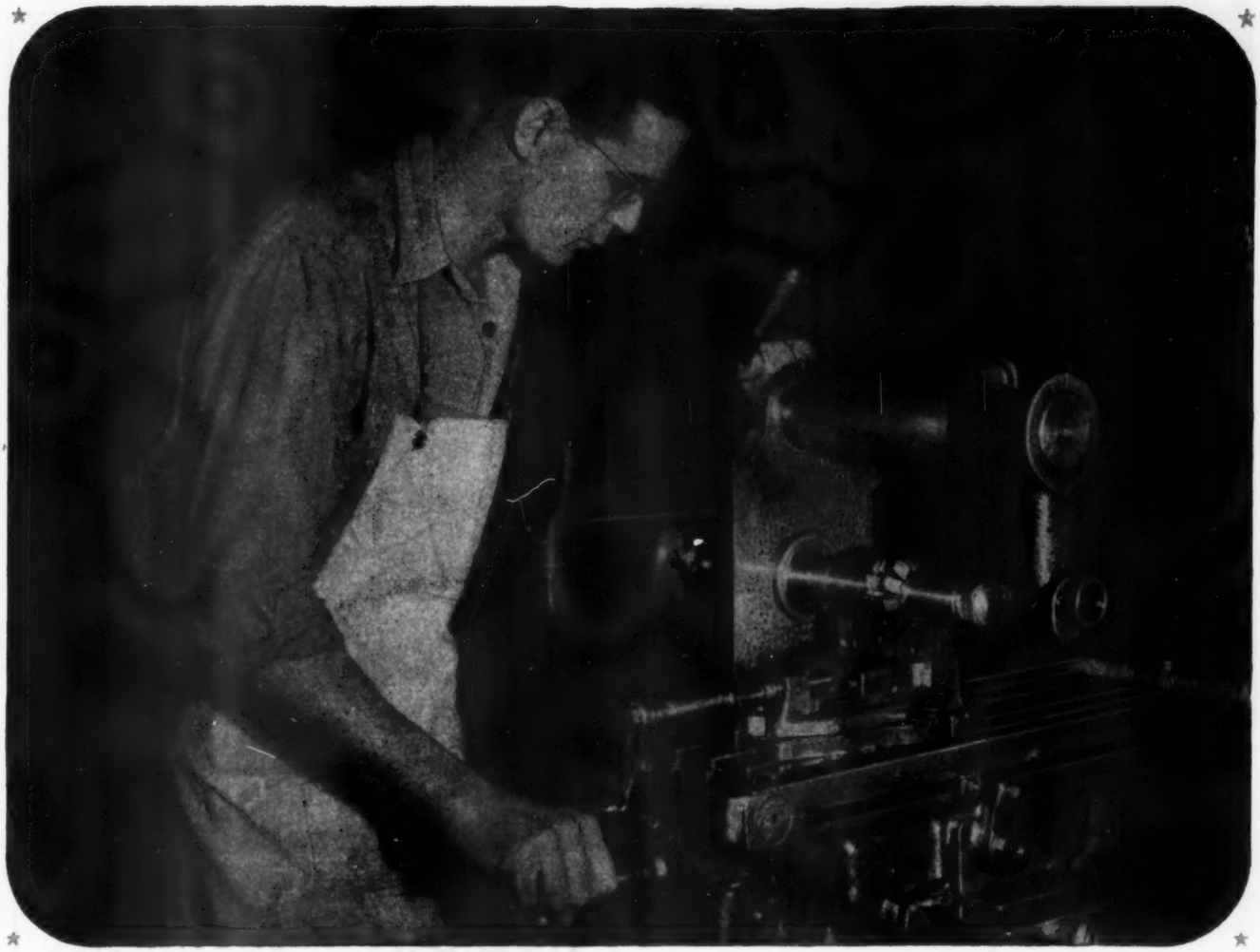
They're all the same to STOW
MOBILE FLEXIBLE SHAFT MACHINES

There's a Stow unit to meet any requirement. For 70 years, since Stow created flexible shafting, that mechanical principle has assumed increasing importance in industry. As applied to operations like grinding, buffing, drilling, wire brushing, Stow shafting enables the workman to take the power to the job. Saves handling of heavy parts, gives wide working range to a single machine because of mobility, allows approach to the work at an angle, lets the operator reach easily into hard to get at positions.

The shaft is all-important on these jobs. Whether it's high or low torque, tough or delicate work, there's a Stow shaft suiting the purpose—driven by a motor that's approved by Stow experience—the longest in the flexible shaft industry. Almost every department needs Stow Flexible Shaft Machines. A catalog of all types is available free. Ask for it now.

STOW MANUFACTURING CO.
29 Shear St., Binghamton, N. Y.

Inventors and Developers of Flexible Shafting



Check these Main Points

WHEN YOU'RE MACHINING STAINLESS STEEL

At your Service . . .

ALLEGHENY LUDLUM'S FILM LIBRARY

Instructional films on tool and stainless steels—some in full color, all with sound—available for free showings by companies, trade and industrial groups, student training courses, technical schools and colleges, etc., upon request.

WRITE FOR DETAILS

ADDRESS DEPT. AM-35

COME war or peace, stainless will always be a critical material *in the shop.* You'll want to keep rejects and spoilage low, as well as machining time and cost—and there are ways to do it.

Cutting speeds can't be as fast as with carbon steel or low alloys. Tools should be high speed steel or carbide-metal tipped, with a generous rake and a chip breaker, if possible. Keep them sharp, and don't allow the tool to ride on the work, to avoid work-hardening.

More important, check the design of the cutting tool itself, and check the possibility of using one of the special easy-machining grades of Allegheny Metal. Let us help you also to select the right cutting tool from our complete range of High Speed Steels, ALX Cast Alloy Bits and Carmet Carbide Tools.

AL

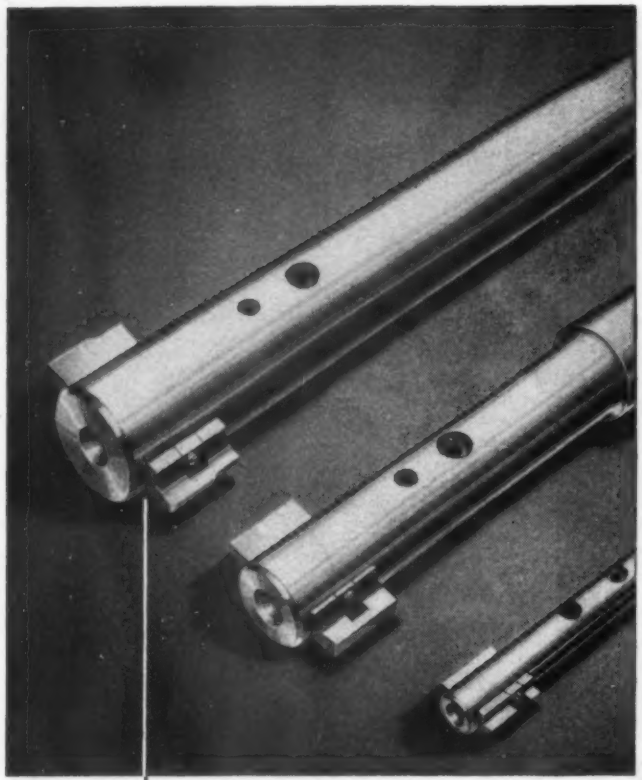
STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum

STEEL CORPORATION

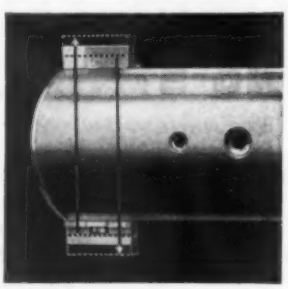
GENERAL OFFICES: BRACKENRIDGE, PENNA.

W&D . . . C-9294 ***Branch Offices in Principal Cities . . . Allegheny Metal also handled by all Joseph T. Ryerson & Sons, Inc. Warehouses***



FLOAT *accurately and precisely controlled*

By floating the cutter blades of Madison reamers compensation for misalignment errors is effected. Most important, however, is the fact that this floating is made right at the point where the cutting action takes place. This exclusive Madison floating feature assures perfect control of the floating action at all times. No special tool holders or chucks are necessary. Only the cutter floats — not the bar. Therefore, there is no chance for inaccuracies due to wobbling of the bar. Possibilities for bell mouth are drastically reduced. Controlled float, however, is just one of many improved reaming principles developed by Madison. Their simplified design provides better chip clearance . . . freer cutting action at faster speeds. Because of Madison's accurate one-screw adjustment these reamers last longer and require much less maintenance time. Reach rock-bottom efficiency in all reaming operations . . . specify Madisons for your production problems now.



The above drawing is purposely enlarged and exaggerated to emphasize and illustrate Madison's exclusive controlled float feature. The manipulation of only two screws is necessary to create any amount of float desired.

To better solve your reaming problems, write for the new Madison catalog . . . shows complete lines, prices and grinding instructions.

MADISON
MANUFACTURING COMPANY
SPRING & BAUER STS., MUSKEGON, MICH.

MADISON
ADJUSTABLE REAMING TOOLS

WYCO *Hy-Speed Saw*

SAWS and FILES
METALS • WOODS • PLASTICS

Fits any ¼" Electric Drill, Air Drill or Flexible Shaft.
Chucks in Drill Chuck or Collet
Uses Ordinary Hack Saw Blades and Standard ¼" Shank Machine Files
Easily Used in Difficult Places
A Speedy, Accurate, Powerful Saw that is an essential tool for every metal or wood worker, machinist and mechanic.

All rotating parts are Ball Bearing and run in oil—no gears—no cams—always smooth running. Saw chuck holds firmly and aligns saw perfectly. A WYCO Guaranteed Tool—Send for Catalog on Complete Line of WYCO Profit Producing Tools and WYCO Flexible Shaft Equipment.

$35.00
Complete, with extra saw blade and ¼" round machine file
Distributed Only Thru Jobbers

WYZENBEEK & STAFF, Inc.
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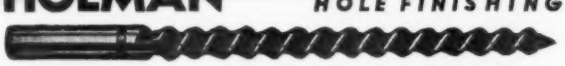
HOLMAN *BETTER, FASTER HOLE FINISHING*



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REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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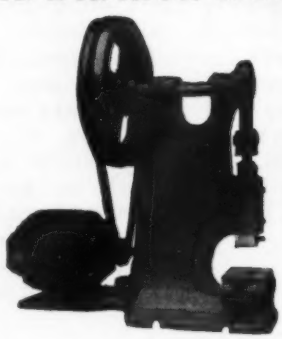
DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

H. & H. *HIGH SPEED SAFETY CLUTCH* BENCH PRESS *for Small Metal Stampings*



Save money on die construction by using this High Speed, inexpensive press instead of large expensive presses. Large throat permits use of a sub press unit.
Ram stroke ⅞" — Adjustable ram.
Depth of throat 5"—
Capacity 2½ ton.
Write for Circular and full information

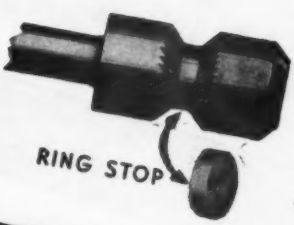
H. & H. MACHINE TOOL CO., Waltham, Mass.

Special Purpose Tools DESIGNED AND GROUND

BY SEVERANCE, SPEED FINISHING IN UNUSUAL APPLICATIONS

JOB #257-496-A
Special Chatterless Ball Seat Reamer

Severance produced this special cutter for finishing ball seats on steering gear tie rod adjusting screws. Made of SAE 1020 steel; this cutter is run at 100 R.P.M.'s on a Screw Machine. This cutter holds its keen cutting edges under long, hard usage and insures close-tolerance reaming.



JOB #324-652-D
Double Angle Deburring Cutter

This specially designed Severance Cutter quickly removes burrs from two edges of an aluminum part simultaneously. Inserted between the two cutting surfaces is a ring-stop which determines the amount of stock to be removed.

No matter what your finishing requirements may be, Severance is equipped and manned to produce any type of special cutter to do a superior job quickly. Skilled Severance engineers will originate a design for the tool you need from your blueprints, sketches or sample part. Their know-how means a special cutter of practical design for you—and Severance craftsmanship means it will be produced to meet exacting Severance standards of durability and efficiency.

In addition to special cutters Severance manufactures a complete line of midget milling cutters and also maintains a complete regrinding service in six plants strategically located from coast to coast.

Severance MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICHIGAN • PLANTS IN LONG ISLAND CITY, NEW YORK; DETROIT 2, MICHIGAN; FORT WAYNE, INDIANA; CHICAGO 6, ILLINOIS; AND LOS ANGELES 21, CALIFORNIA. IN CANADA: 60 FRONT STREET WEST, TORONTO, ONTARIO.

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This entirely new 36 page catalogue is now ready for distribution. Valuable, up-to-the-minute information is presented on Park Salt Baths, Carburizing Compounds, Quenching and Tempering Oils and Protective Coatings. Included also are useful charts illustrating case depths obtained at various times and temperatures in Park's liquid and solid carburizers. Please enter your request on your company letterhead today.

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PARK CHEMICAL CO.
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WIDER PRODUCTION VERSATILITY . . .

GREATER OPERATION SAVINGS

for your

BURRING, FINISHING, POLISHING

With 3 RUBBER-CUSHIONED BRIGHTBOY TEXTURES

Each of these three abrasive textures is combined with resilient rubber in BRIGHTBOY products that are adaptable to a wide variety of close-tolerance and precision finishing. These abrasive textures still further widen BRIGHTBOY's ability to save the operations between the grind and the buff. The rubber rubs, "cushions," cleans. It joins with the abrasive in finishing and in achieving a quality polish that is often the final.

Ask your distributor about the versatility of BRIGHTBOY products in each of these three textures. Get prices and production literature. And consult our service representatives on any of your finishing problems.

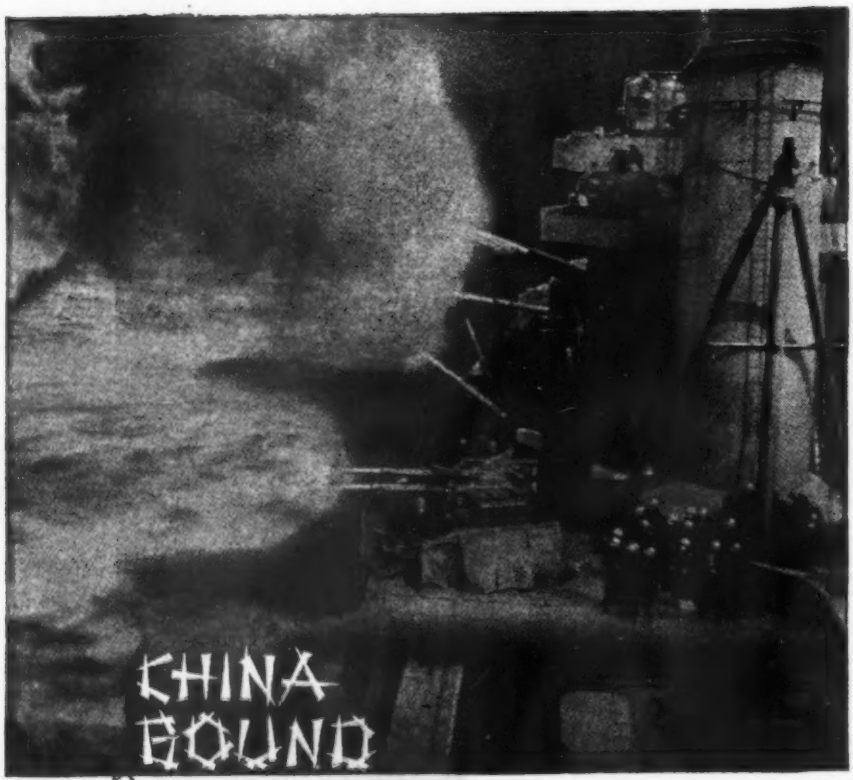
BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
NEWARK 7, N. J.

BRIGHTBOY TUFF-TEX
Tougher texture, for finishing hard metals. The tougher binder accents the abrasive action, yet retains the soft rubber cushion, finishing and polishing in one operation.

BRIGHTBOY STANDARD
Brightboy STANDARD texture is a favorite for burring, finishing and polishing on the widest variety of metals and metal parts.

BRIGHTBOY FINE-TEX
Smoother, finer texture for work on softer metals, producing special finishes and for applications where the coarser wheel might not be suitable.

WELDON ROBERTS
Brightboy



Trim, efficient, American Naval craft are daily blasting out victories in Pacific waters. Regularly, United Welding lends a hand in that victorious advance.

The fabrication of diesel frames, gear housings and other equipment is, and long has been, on a production basis at United. The overall tonnage must remain undisclosed but it would surprise you.

United is also active in the domestic field, will greatly expand in that direction in happier times —fabricating in ever growing volume:

Machine tool frames, bases, levers.

Paper making equipment.

Fans, impellers, blower housings.

Automotive and crane parts, etc.

Perhaps you are building, or preparing to introduce, a product that can be, and should be, welded. If so, call on our engineering staff, or submit your drawings for estimates. If you can lighten it, yet strengthen it, improve its appearance and perhaps reduce the cost, it is to your interest to do so.

ARMY E NAVY

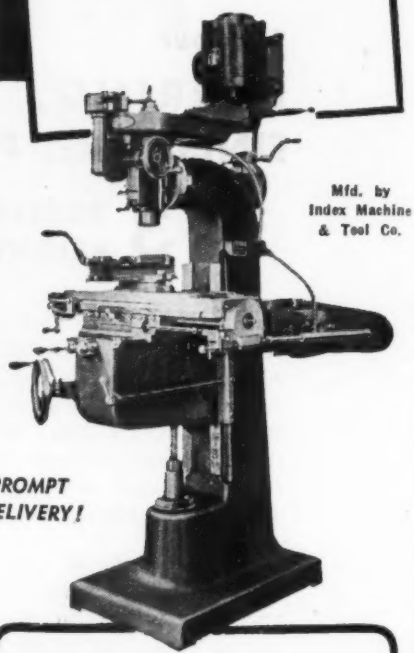
WELDING ENGINEERS · UWCO · MIDDLETOWN, OHIO

THE UNITED WELDING CO.
MIDDLETOWN, OHIO

WELDING FABRICATORS OF MODERN DESIGNS

INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

Illustrated on a large grinder is a Walker 72" Electro Magnetic Chuck. As evidenced by their universal use, Walker still pioneers the field.

Submit your production problems to

O. S. WALKER CO., Inc.

100 ROCKDALE STREET **WORCESTER, MASS.**

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

18 WAYS TO SAVE TIME & MONEY!

with the Mead Industrial Burring Machine

For Metal—Wood—Plastic

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time"—install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.

MEAD SPECIALTIES COMPANY
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L-W LATHE CHUCKS

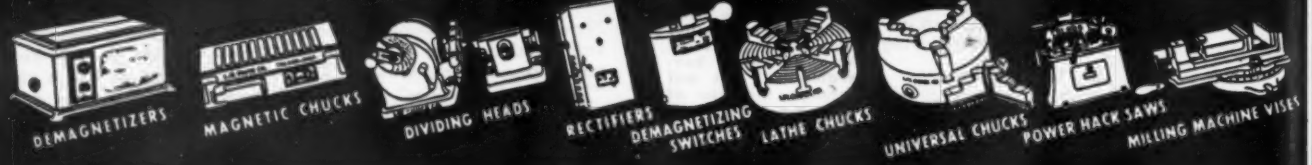
L-W LATHE CHUCKS

Hardened steel jaws, accurately ground, have wide gripping surface. Body is semi-steel, heavily ribbed, and will stand up under unusual strain. Steel thrust bearings are provided to assure durability.

10" Size	$33.45
12" Size	$38.30
14" Size	$43.45
16" Size	$55.60
18" Size	$73.60

Three-jaw Universal chucks are available in 6¼" ($45.00), 7½" ($55.00), and 10½" ($75.00) sizes.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



L-W CHUCK COMPANY 5 N. ST. CLAIR ST. TOLEDO 4, OHIO

Consistently Closer Duplication

MEANS CONSISTENTLY BETTER TOOL AND CUTTER SHARPENING

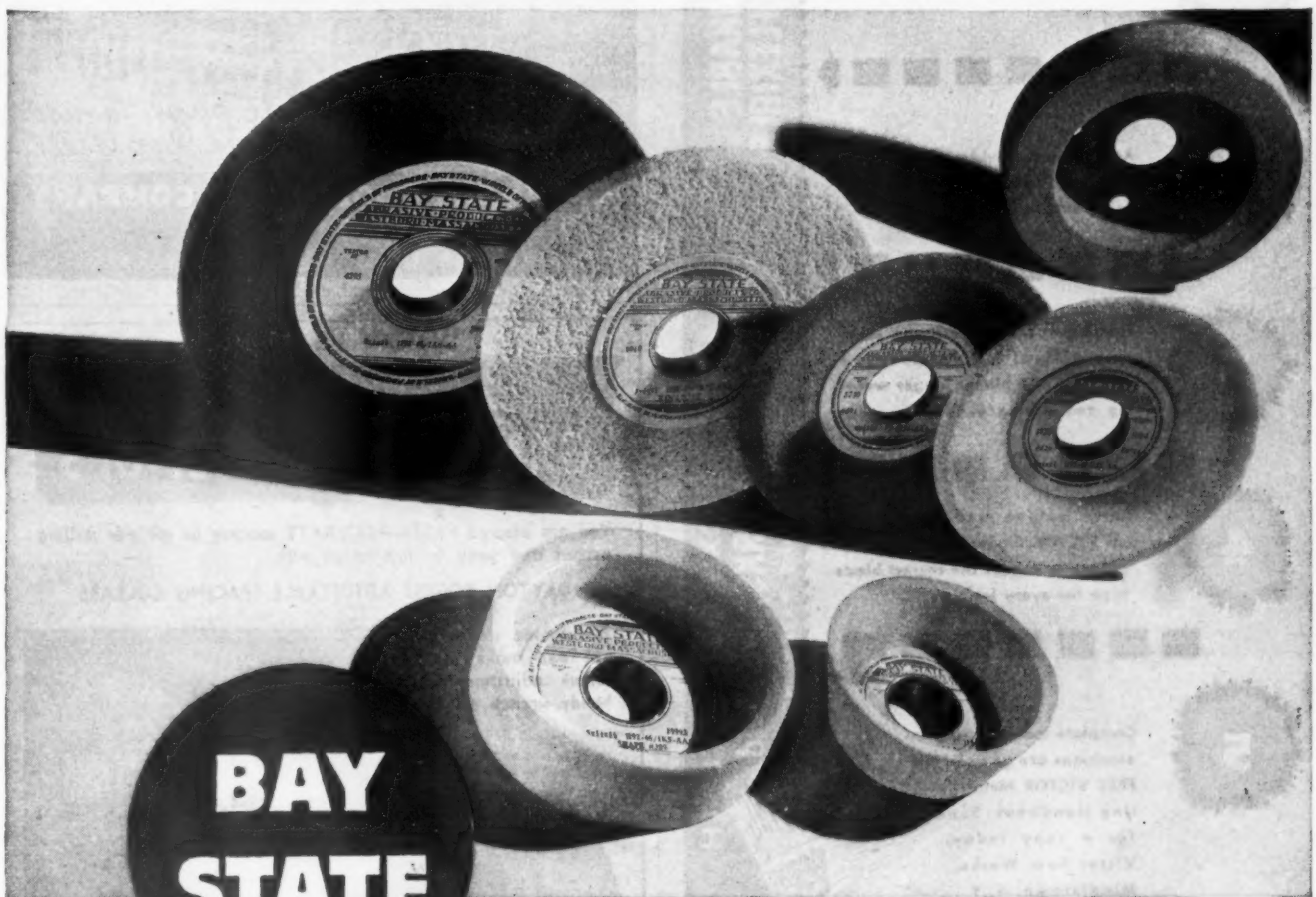
The extra effort Bay State makes to duplicate, on each order, exactly the specifications you have determined are right . . . pays off in cutting tool performance.

"Fractional grading"—an exclusive Bay State manufacturing method—offers a more precise selection of wheel hardness. Within the range of each regular grade, Bay State offers three fractional grades. Once you "fit the grade to the grind", you can be much more sure of duplicating exactly the wheel you want.

Also with Bay State grinding wheels, you get the advantages of Bay State's vitrified bond —an extra-strong bond that permits more open structures. Such wheels run cooler and faster. Other types of vitrified and resinous bonds are available for any need. Bay State's "Koolpore" gives you an extremely open and porous wheel — especially suited for cemented carbides.

Send for complete details and tables — ask for Bulletin F containing description of Bay State's 6A and 8A for production grinding of duplicate parts, and "Koolpore" extra-cool cutting wheels. Bay State offers a complete line of bonded abrasive products and individualized engineering service.

BAY STATE ABRASIVE PRODUCTS CO.
1 Union Street, Westboro, Mass.



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ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DIS S AND CYLINDERS

KNOW THESE VICTOR BENEFITS...

1 Keen, sharp teeth; hardened to cut deep and wear longer.

2 Accurate set provides ample clearance and accuracy of material being cut.

3 Finest grade of high speed steel, scientifically heat-treated gives VICTOR Blades longer wearing and cutting qualities.

4 Large, easy to read markings, on all VICTOR Blades make it a simple job to choose the correct blade type for every job.

5 Complete metal cutting instructions are given in this FREE VICTOR Metal Cutting Handbook. Send for a copy today. Victor Saw Works, Middletown, N. Y.

VICTOR

Makers of hand and power hack saw blades, frames and metal cutting band saw blades.

VICTOR UNBREAKABLE SPECIAL FLEXIBLE
VICTOR SAW WORKS, Inc., Middletown, N.Y., U.S.A.
10X½ .025-18 TEETH
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Columbia TOOL STEEL

COUNTER-OFFENSIVE—
To the home front this means new effort in producing supplies and material.
Good Tool Steel is ready and able to do its part.
It pays to use Good Tool Steel

COLUMBIA TOOL STEEL COMPANY
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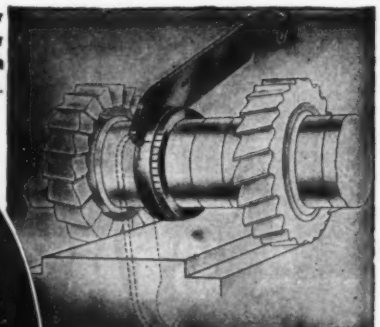
SAVE TIME ON YOUR GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling setups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅜" to 2".

Write for illustrated bulletin $120-1

DAYTON ROGERS MFG. CO.
2856 12th Ave. S. Minneapolis, Minn.

Help yourself to faster, more economical operation

SEND FOR BULLETIN No. M-101

MODERN-MAGIC CHUCK AND COLLET EQUIPMENT

Equip your multiple or single spindle machines, used for a sequence of operations, with MODERN-MAGIC Chucks and Collets, and step up your production. Idle time of revolving spindles is reduced to zero . . . tools can readily be changed while the machine is running. Single spindle machines are given practically multiple spindle range by these MODERN tools. They pay for themselves many times over in time saved. Full information upon request. Why not investigate today?

PROMPT SHIPMENT.... USUALLY FROM STOCK

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DIVISION OF

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PRODUCTION THREADING

SPEEDY! ACCURATE! EASY!

WITH THE GEOMETRIC STYLE D SELF-OPENING DIE HEAD

Known all over the world wherever metal is worked on a production basis, the Geometric Style D Self-Opening Die Head is a heavy, sturdy tool that "goes places" on large-diameter, coarse-pitch threading jobs. (It's one of the few die heads built to cut 2"—4½ U. S., 3"—4 U. S., etc.) Use the Style D for all threads up to 3½" diameter . . . . any length up to the limits of your machines . . . . close to the shoulder if necessary. Special roughing and finishing attachment on all sizes over ¾" allows two cuts to be taken on coarse-pitch threads —increasing accuracy and reducing load on tool and machine. Extra heavy, rigidly mounted chasers are designed for easy removal and accurate adjustment; cam-controlled, they open and close uniformly, instantaneously. Geometric Style D is built for speed, power and precision that add up to ECONOMY on all types of threading jobs within its range.

GEOMETRIC STYLE DD

For use on Heavy Duty Turret Lathes of the Warner & Swasey, Libby, Acme, Foster and Gisholt Type, or may be used on lighter machines where the floating action is desired. Floating principle allows thread to be started easily, to be cut smoothly and accurately even though turret is so heavy as to prevent operator following lead of thread by feel. Adjustable tripping device insures cutting of threads to precise length.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN 15, CONNECTICUT

ARMY E NAVY

Machines and Tools for Cutting Screw Threads Economically

SELF-OPENING DIE HEADS — SOLID ADJUSTABLE DIE HEADS
COLLAPSING TAPS — SOLID ADJUSTABLE TAPS
CHASER GRINDING MACHINES — THREADING MACHINES

because Oakite surface preparation kept this shell's paint coat on!

THIS "Long Tom" shell is ready for action! Its protective paint coat INTACT. Mute evidence that it has successfully withstood the corrosive attack of salt sea air, steaming jungle mists and tropical heat . . . on its journey to the fighting front.

OVER 49% of the prime contractors making 155 mm. "Long Tom" shells, 105 mm. and 24 mm. howitzer shells, 75 mm. and 90 mm. shells, 5" Navy shells, rocket shells, use specialized Oakite materials for cleaning, rust removal, surface conditioning or related operations. They KNOW that because of the outstanding qualities of these materials plus the complete thoroughness of Oakite methods . . . paint coats will grip surfaces . . . will adhere tenaciously and protect shells until ready for use.

Oakite Technical Service Is Free!

WHETHER you are making heavy shells, small arms ammunition, bazooka or rocket parts, bombs, grenades, machine guns, anti-aircraft parts, tanks, jeeps . . . take advantage of successful Oakite experience on this and other war work. Our nearby Technical Service Representative stands ready to cooperate with you to help wherever cleaning and related operations on war supply items are concerned. His services are free . . . ask to have him call. Or write and tell us your problem. Inquiries promptly answered.

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK 6, N.Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE MATERIALS . METHODS . . . SERVICE

Buy Bonds for Victory

CLEANING FOR EVERY CLEANING REQUIREMENT

TAPPING TIPS

From Woody Spencer's Notebook

AVOIDING TAP BREAKAGE

Most every shop I know tries some way to beat that old bogey—broken taps. Some use a "soft" safety insert in the tapping head. Some cut slots around the shank so the tap will break high enough above the hole to make removal easy. On some of the older type machines I've seen an adjustable idler on the belt. The boys set it for just enough pressure to drive the tap. Then, if the tap stops, the belt slips. Seems to me a mighty good way to save both tap and material.

Tapping Tips, as Woody presents them here are not intended to provide the solution for all tapping troubles. But, if they do save some time or make some routine job run a little easier, we'll feel they're well worth while.

On the other hand, almost every tapping operation presents an individual problem that requires a specific solution. We urge, therefore, that you send us complete details of any tapping problem (material, diameter, depth, lubricant, etc., etc.) and our engineers will be glad to make definite recommendations to help you.

**Note: Woody Spencer's Tapping Tips will appear here as regularly as "Woody" gets time to write them up. Watch for them.*

THE RIGHT TAP AT THE RIGHT TIME

The Wood & Spencer Company

Cleveland 3, Ohio

IMMEDIATE DELIVERY

No. 1 to 60
New High Speed
Long Length

DRILLS

No. by Gage	Length	Our Price Net Each
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
31 to 40	5¼	.75
41 to 50	4½	.75
51 to 60	4¼	.75

If you buy 60 drills or more — 20% discount

VICTOR
MACHINERY EXCHANGE
INC.
251 CENTER STREET
NEW YORK N. Y.

You can profit by this man's experience!

THIS is a picture of "Chuck" Calvin in our surface grinding department. He has had years of experience as a specialist in surface grinding. His skill in precision grinding operations has contributed no small part in the development of extreme accuracies and finishes of U. S. Broaches.

But, "Chuck" is just one of the U. S. Broach personnel who contribute their skill and technical knowledge to the design and manufacture of broaches.

And you can profit by the combined experience of these men, because their ability to engineer the job to your particular production requirements, and then execute it exactly as engineered, effects definite savings for you in man hours and production time.

Perhaps you have metal cutting problems that can be performed more efficiently by broaching operations. If you have, may we suggest you write our sales department today for information about our complete designing service.

★ *Write today for our 4-color brochure. It contains technical information you'll want for ready reference.* ★

U.S. BROACH Company

USB

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BROACHING TOOL

TELEPHONE TWINBROOK 1-2211

. . . better able to "take it"

GORHAM

HIGH SPEED STEEL GROUND TOOL BITS

"Born right and raised right"—That accounts for the outlasting stamina in Gorham's "family" of superior quality Ground Tool Bits . . . Gorham knows that good tool bits for different applications require great care in the *selection* and *heat treatment* of materials . . . Thus, you'll find Gorham bits everywhere delivering *more* cuts per grind and *more* cuts per tool . . . All of which naturally means substantial savings in production costs . . . So, why not take a "tip" from the Gorham family—and do the job right—at least cost?

3 DISTINCTIVE CUTTING MATERIALS

GORHAM STANDARD
For the commercial field

GORHAM M-40-B
For heavy cuts in hard material

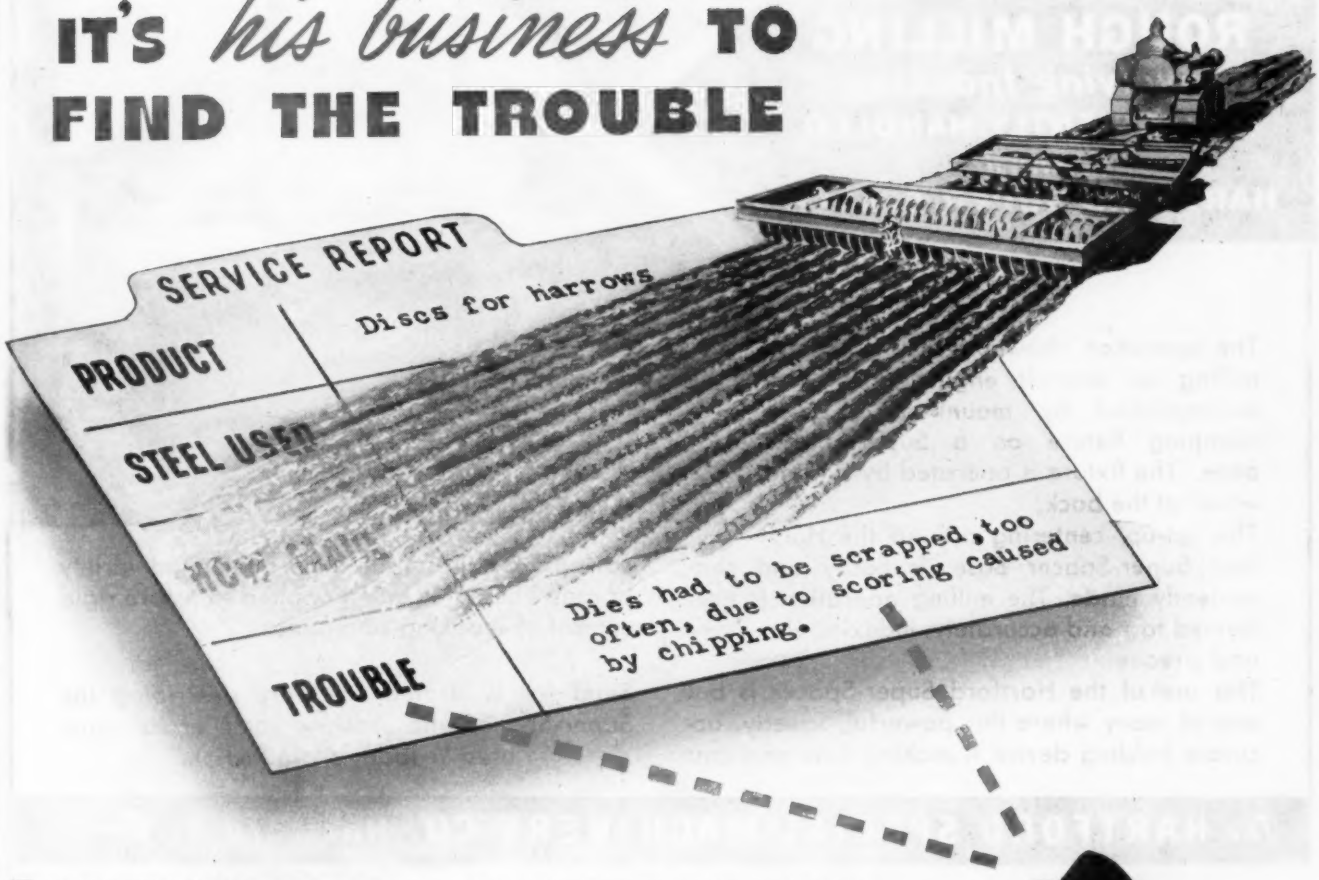
GORHAM GORMET
For more abrasive materials

GORHAM TOOL COMPANY

14400 WOODROW WILSON AVENUE

DETROIT 3, MICHIGAN

IT'S *his business* TO FIND THE TROUBLE



The discing of the land is an important step in growing the world's food supply. The making of these discs is equally important to those whose business it is to manufacture them as economically as possible.

What has this to do with Latrobe's Metallurgical Service? Simply this: Recently, a manufacturer was confronted with a problem that involved the dies from which such discs were made. The discs were carbon steel, in the "as rolled" state, .90 to .158 thick. The dies were 18" O.D. x 16" I. D. x 4" thick. These dies were failing because of sinking, and the resultant chipping scored the dies full length, making it necessary to scrap them.

A Latrobe *Service Engineer* was called to help. After a comprehensive study of all conditions, he decided to recommend a die steel of higher compressive strength and greater toughness. The result—*25,000 pieces per grind* instead of 7,000 pieces—*and the die still in excellent condition.*

* * *

This is a typical instance of the kind of help Latrobe's Service Engineers are anxious to render to any customer. It's the business of these skilled men to know where to look for trouble . . . and what to do about it! It's a service Latrobe renders without cost, so that the products you make can be produced more efficiently and economically.

Write us your problem—and we'll be glad to supply the answer.

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT — LESCO — LATROBE · PENNSYLVANIA

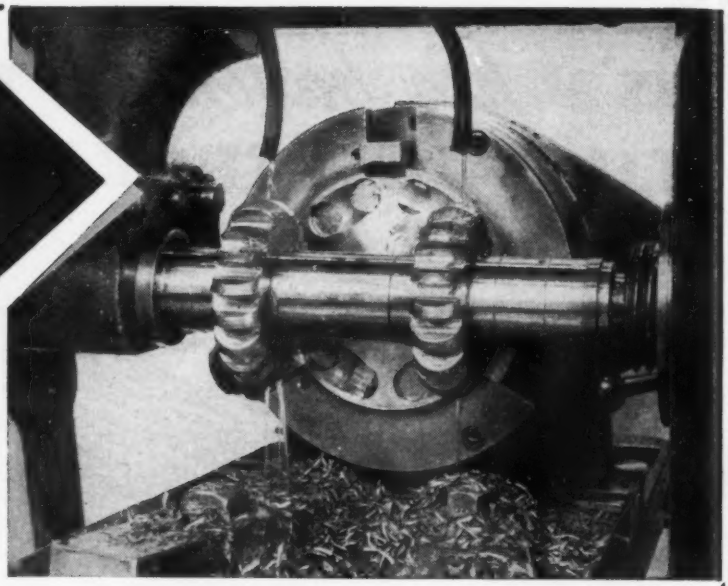
HIGH SPEED STEELS · DIE STEELS · TOOL STEELS · STAINLESS

LATROBE RED ARROW for metal-cutting tools

S-1

LATROBE *Metallurgical Service*

ROUGH MILLING
Involving Indexing
CONVENIENTLY HANDLED
with a
HARTFORD SUPER-SPACER



The operation shown here . . . rough milling an aircraft engine part. This accomplished by mounting a quick clamping fixture on a Super-Spacer base. The fixture is operated by a hand wheel at the back.

This set-up, centering around the Hartford Super-Spacer Base, is easily and conveniently made. The milling operation is performed fast and accurately; indexing is positive and precise.

This use of the Hartford Super-Spacer is but one of many where this powerful, speedy, accurate holding device is making time and cost savings. It points to an almost unlimited variety of uses where it is being applied to assure rigid control of indexing operations.

Send for illustrated literature describing the Super-Spacer and showing some of its many uses in today's production.

The HARTFORD SPECIAL MACHINERY CO. Hartford 5, Conn.

GAUGES — DIES
JIGS — FIXTURES

MASTER GAUGE CO.
2214 FENKELL AVE. DETROIT 21, MICH.
Phone: University 3-7676

WHEN COLLET WORK IS INDICATED - SPECIFY

Precision Collets

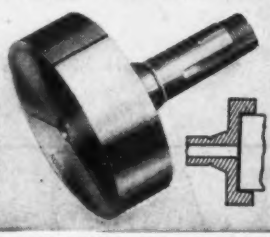
For 10" ATLAS & LOGAN, SOUTH BEND, SHELDON, CRAFTSMAN, POWR-KRAFT, CLAUSING and other important lathes.

IMMEDIATE DELIVERY FROM STOCK

The *Precision* name on a collet is your unconditional guarantee of accuracy in machining, hardening and grinding. Make sure then to specify *Precision* when ordering from your dealer. Literature on request.

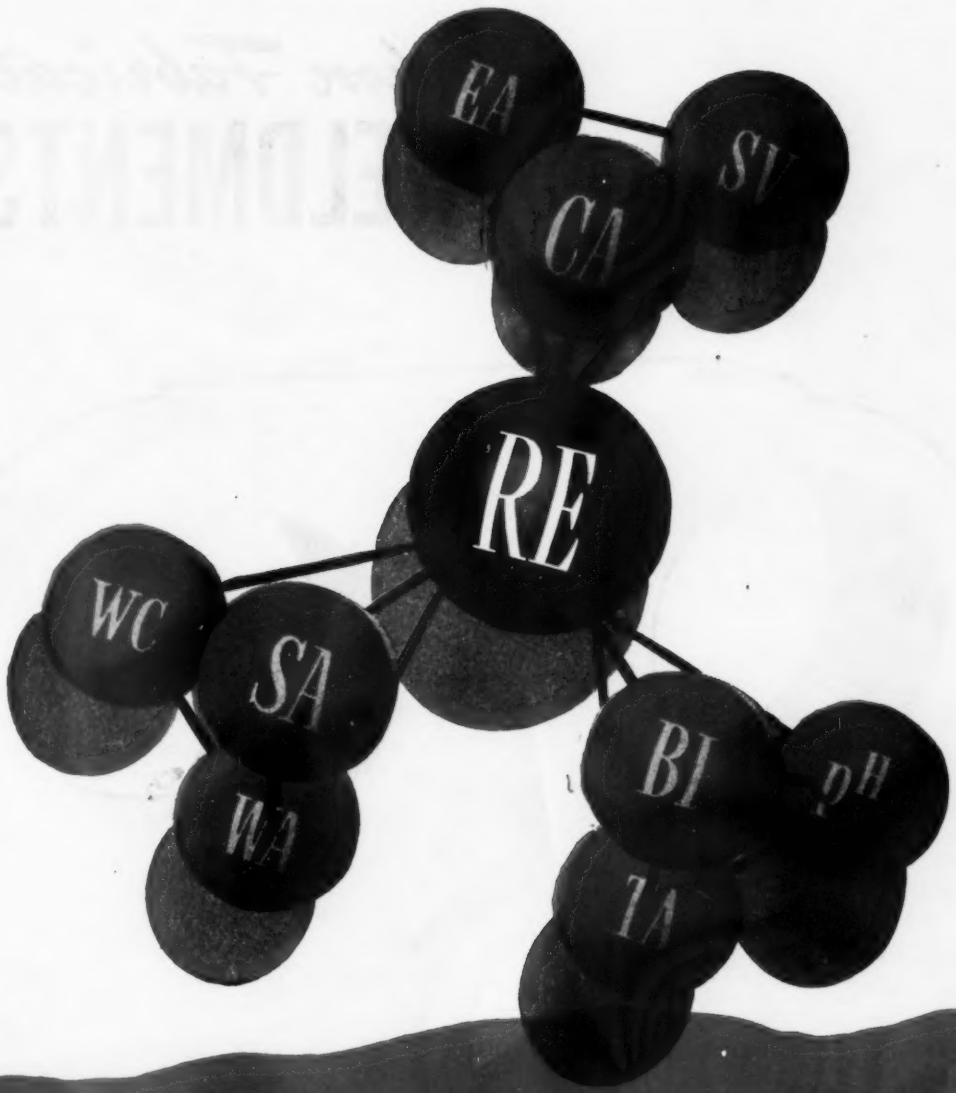
- MODEL 3AT. For 10" Atlas, Logan, 12" Craftsman, No. 700 Powr-Kraft.
- MODEL 3C: For 8" & 9" South Bend, Clausing, Hardinge No. 3, 10" LeBlond, etc.
- MODEL 1A: For 8" & 9" South Bend.
- MODEL 5C: For 9", 10", 16", 18" South Bend, 1" capacity Sheldon, Schauer, Sebastian, etc.
- MODEL 4C: For 14½" South Bend, ¾" capacity Sheldon, Hardinge No. 4, Elgin, etc.
- MODEL 480: For Logan Screw Machine, Turret Lathe and attachments; Warner & Swasey No. 1, etc.
- BREN Collet: For Handwheel & Lever-Type Speedichuk.

KLUTCH - KOLLET (Step Chuck) for chucking work to 2¾" diameter with collet accuracy. Head unhardened for easy boring. Fits 3AT, 3C, 1A adapters only. List unbored $7.50 each.



- 5C KLUTCH-KOLLET NOW READY. List unbored $10.50.
- PRECISION Collets also available in Hex. and Square.

GENERAL DIE-STAMPING-TOOL COMPANY • 282 Mott St., New York 12, N. Y.



THIS IS WHAT HAPPENS WHEN YOU BATHE METAL

Correctly cleaning metal is no simple operation... these elements must go into action...

Wetting Action *(WA)* must lower surface and interfacial tensions and allow the cleaning solution to penetrate to surface of the base. Emulsifying Action *(EA)* must disperse grease and oil as tiny globules, and by suspension prevent redeposition. Saponifying Value *(SV)* must convert organic fats and oils into soluble soaps, and Solvent Action *(SA)* put soils into solution. Colloidal Activity *(CA)* must disperse solid soils into minute particles which may then be easily removed. Water Conditioning *(WC)* removes or controls the elements which cause water hardness.

Correct Buffer Index *(BI)* assures ability to absorb either alkaline or acid soil, thus prolonging efficiency of the solution. Proper *pH* assures the correct measure of energy of alkalinity and Total Alkalinity *(TA)* must supply maximum active cleaning energy.

In formulating a cleaning compound, therefore, it is obvious that no one factor is a magic key to all problems. The answer is in determining the relative value of *all* these factors as they apply to your problem.

Putting these factors into correct balance is a responsibility you can entrust to Turco chemists —a responsibility for which their two decades of Research and Experience *(RE)* have well qualified them. *Take your problem to Turco.*

For a fuller explanation of these vital factors, write for Turco's Booklet on your firm letterhead, please.

TURCO

TURCO

INDUSTRIAL CHEMICAL COMPOUNDS

A.M. 2

TURCO PRODUCTS, INC. *Main Office and Factory:* 6135 S. Central Ave., Los Angeles 1, Calif. • *Southern Factory:* 1606 Henderson St., Houston 1, Texas • *Chicago Office and Factory:* 125 West 46th Street, Chicago 9 • *Offices and Warehouses in All Principal Cities*

Mahon Fabricated WELDMENTS

Fabrication of parts, such as this Gear Case, typifies the kind of work that combines to make up the thousands of tons of weldments Mahon is called upon to produce.

The attention of all industry has been focused on WELDED STEEL PLATE CONSTRUCTION in the fabrication of implements of war—a condition that is certain to carry over into the manufacture of peacetime parts and products.

The advantages are manifold. WELDED STEEL PLATE is stronger and lighter. It requires less machining and finishing. It eliminates pattern expense and reduces scrap. It is non-porous. It presents a smoother, finer, appearance and, in nearly all instances, parts and products can be produced in quicker time—at a very attractive cost.

Supplementing the extensive production facilities available at Mahon is a staff of experienced design engineers. These men are prepared to give you exact and complete information in adapting your product to the advantages of WELDED STEEL PLATE CONSTRUCTION. They will also assist you in its re-design if that should be required.

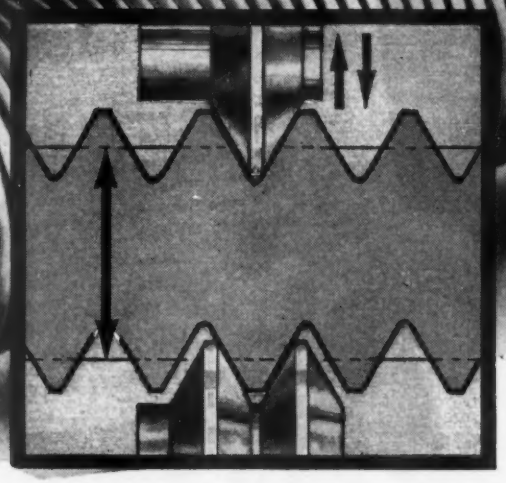
THE R. C. MAHON COMPANY

DETROIT 11 *CHICAGO 4*

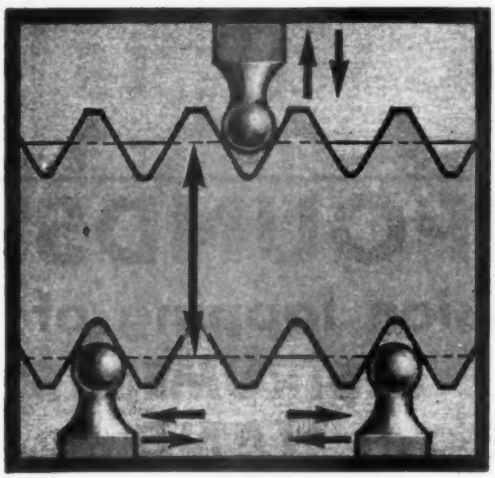
Fabricators of Machine Bases and Frames and Many Other Welded Steel Plate Products

A Faster Way to Inspect PITCH DIAMETERS

Positively, More Accurately and to closer tolerances



MODEL 45B-100. The upper, sensitive roller contact actuates the Dial Indicator.



MODEL 45B-80. The upper, sensitive ball contact actuates the Dial Indicator. Both lower ball anvils float sidewise independently to compensate for any variation in lead.

No conventional type of gage, whether ring gage or roller-type snap gage, can tell you so **definitely** and so **quickly** the degree of accuracy of a pitch diameter as these two types of Dial Indicator Gages. Neither depend upon the uncertain sense of touch.

The roller type tells more than the conventional roller snap gage because the sensitive upper roller contact, reveals on the Indicator, just **how much** and **where** the pitch diameter may be wrong. The ball type simulates the three-wire method, but is faster. It is accurate to a tenth of a thousandth. Either type is incorporated in the adjustable Dial Indicator Gage shown below. For details write—

TWO FULL COLOR FILMS
(With Sound)
No. 1 DIAL INDICATORS
No. 2 DIAL INDICATOR GAGES
20 minutes each. For instruction and training.
For showing write →

FEDERAL PRODUCTS CORPORATION
PROVIDENCE 1, RHODE ISLAND

ARMY E NAVY

CHICAGO • CLEVELAND • DETROIT • DALLAS • HARTFORD • HOUSTON • INDIANAPOLIS • LOS ANGELES
MEMPHIS • MILWAUKEE • MINNEAPOLIS • MONTREAL
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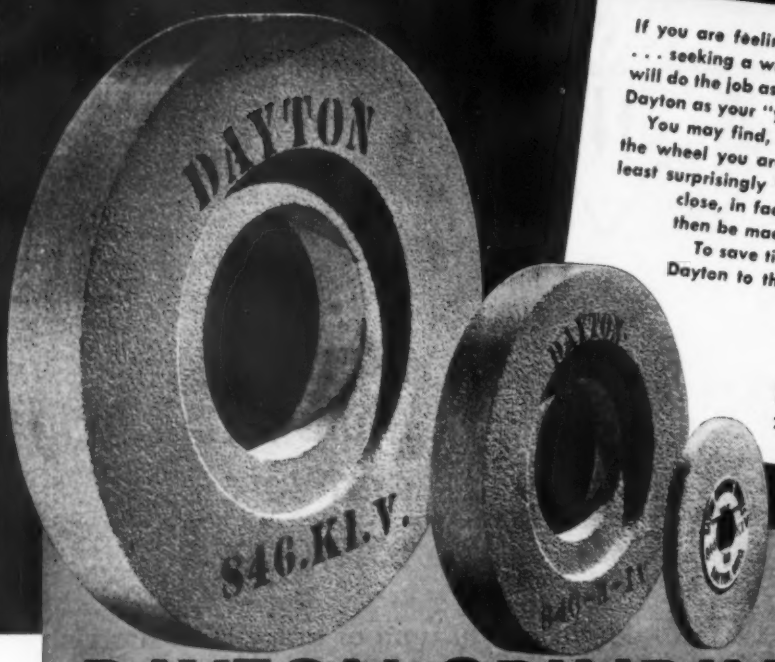
WINDSOR

★ FEDERAL ★

PRECISION MEASURING INSTRUMENTS

A PROVED SURFACE GRINDING "YARDSTICK"



If you are feeling your way on some surfacing operation . . . seeking a wheel of the grain, grade and structure that will do the job as your "spec" requires—use the 846 K-1-V Dayton as your "yardstick".

You may find, as so many have found, that it's exactly the wheel you are looking for. If not, you will find it at least surprisingly "close" to what you've got to have. So close, in fact, that selection of the correct wheel can then be made without further experimentation.

To save time, money, worry—put this 846 K-1-V Dayton to the test now. Made in a wide range of sizes—with trial wheels shipped from stock.

Write, wire or phone today.

SIMONDS WORDEN WHITE CO.
712 NEGLEY PLACE, DAYTON 7, OHIO

DAYTON GRINDING WHEELS

LAPPING COMPOUNDS

made expressly for precision lapping of GAGES • DIES • TOOLS • INSTRUMENTS PLATE . . . MACHINE . . . HAND

The abrasives are suspended in a special grease composition paste base that becomes an oily film under pressure of lapping. This base was developed expressly for hand, plate and machine lapping. For dilution or extra lubrication mix with small quantity of thin film oils such as kerosene, spindle.

MEDIUM COARSE

Grade No. 302½ ..... 60c per lb.

EXTRA FINE

Grade No. A-600
Crystolon ..... 75c per lb.
TM. Reg. U. S. Patent Office
(silicon carbide)

Grade No. A-600
Alundum ..... 75c per lb.
TM. Reg. U. S. Patent Office
(crystalline alumina)

MEDIUM FINE

Grade No. 303½ ..... 60c per lb.
Above packed in 10½ and 52 lb. cans.

VERY EXTRA FINE

Grade No. 2600A ..... 90c per lb.
Grade No. A-20X ..... 90c per lb.
Grade No. 38-900A ..... 90c per lb.
(special chrome plate)
Grade No. GK-7A ..... 90c per lb.
(high reflective finish on steel)
Packed in 8½ and 42 lb. cans.
Large Glass Jars, all Grades ..... $1.00 each

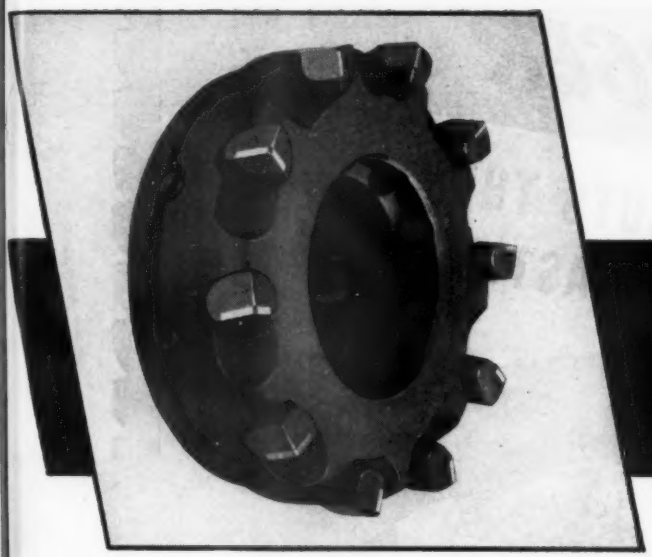
Sample carton containing 1 oz. jar of each of the above compounds mailed post paid upon request.

"LMKT"
LAPPING LUBRICANT
A substitute for sperm oil on lapping operations.
Single gallon cans ..... $2.00 per gal.
Six—1 gallon cans ..... $1.75 per gal.

Also many other compounds: Valve Grinding, Gear Lapping, Ball Bearing Raceways, Finishing, Polishing —All Types. Write us for samples. Recommended by Norton Company for use on their Lapping Machines.

USP

UNITED STATES PRODUCTS CO.
518 MELWOOD ST., PITTSBURGH, PA.



NEGATIVE RAKE

An outstanding production method that is accomplished perfectly with Lovejoy Milling Cutters.

Super-speed milling with negative rake blade angle is a new, unconventional milling method that is producing outstanding results on war production, and promises a new low in costs when peacetime returns.

Lovejoy Milling Cutters, with positive-locking, negative rake blades have proved extremely successful—producing more work, with longer blade life, with finer finish. Lovejoy Cutter Bodies are drilled so that when the blades are assembled they effect the correct negative rake yet retain standard Lovejoy features, such as hardened alloy steel bodies and easily replaceable positive-locking blades. The carbide blades are positioned so that the tip has rugged support and they are interchangeable in mills of the same type over a wide range of sizes. If you wish, you can leave out every other blade (or use only one or two blades) in any Lovejoy Cutter without sacrificing housing strength.

Write to Lovejoy for performance data on negative rake milling. An up-to-date file on this method is kept for your benefit.

Please send me my free copy of "Lovejoy Modern Metal Cutting Tools."

NAME_____ TITLE_____

COMPANY _____

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A. M.

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

MILLING CUTTERS · BORING HEADS · ARBORS · SPOT FACING TOOLS · COUNTERBORES · BORING BARS · SINGLE POINT TOOLS · TURRET TOOL POSTS

RUN YOUR FINGER DOWN THE LIST

DoALL Buttress

THE NEW WIDE SPACED HARD TOOTH SAW

CUTS THEM FASTER

Aluminum Armor Plate
Aluminum Bars
Aluminum, Cast
Aluminum, 14 ST.
Aluminum, 24 ST.
Aluminum, Ingots
Aluminum, Riser Rings
Brass, Yellow
Brass, Ingots
Bronze, Manganese
Bronze, Tempoloy
Copper, Beryllium
Copper, Forged
Iron, Gray Cast
Kirksite
Lead
Magnesium, Alloy
Magnesium Crystals
Celluloid
Ethocel
Farlite
Formica
Zinc
Saran
Rubber
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●Light metals, alloys, plastics, laminates, plywoods—the list of new materials is long, the advantages many! They're light in weight, extra hard, unaffected by temperature changes, have great tensile strength, ductility or transparency. Some are wartime discoveries, all are due for peacetime use.

Designed to handle these materials is the amazing new DoALL Buttress Saw—already establishing undreamed-of cutting records in war plants.

Available in various widths and pitches for contour or straight line cutting, the DoALL Buttress Saw awaits your consideration.

Immediate delivery from all our supply points.

Send for Literature today.

FREE LABORATORY SERVICE

Consider our modern laboratory as your own. Send in sample of any hard-to-cut material and our engineering staff will get busy and give you a written report of findings and recommendations.

DoALL

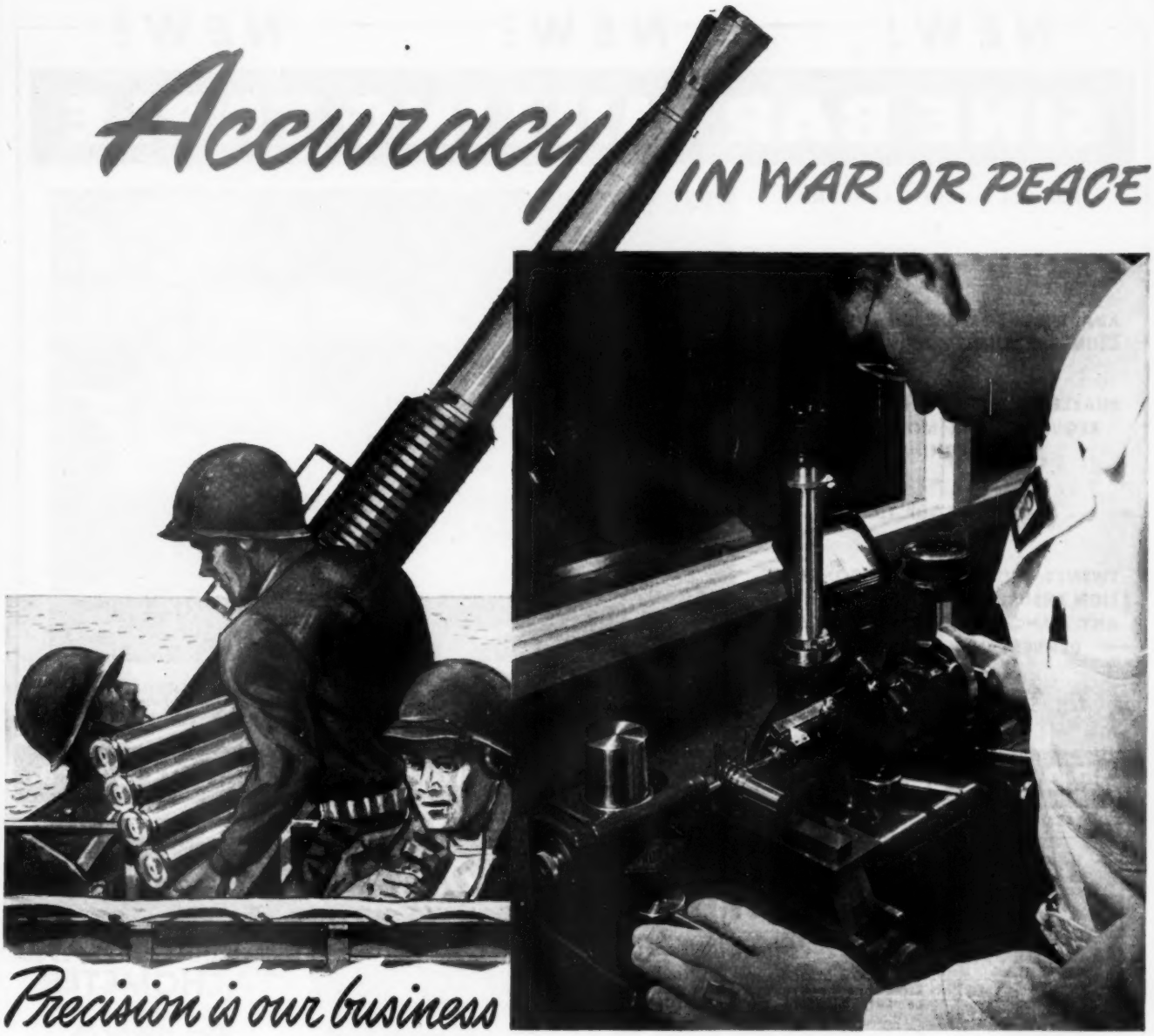
INDUSTRY'S NEW SET OF TOOLS

THE DoALL COMPANY

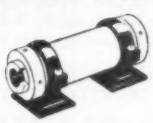
201 N. Laurel Ave. **Des Plaines, Ill.**

Sales & Service Offices: Baltimore, Birmingham, Boston, Chicago, Cincinnati, Cleveland, Denver, Detroit, Erie, Grand Rapids, Hartford, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Oklahoma City, Philadelphia, Pittsburgh, Portland, Rockford, St. Louis, San Francisco, Seattle, Syracuse, Toledo

Accuracy IN WAR OR PEACE



Precision is our business



Accuracy is all-important to the anti-aircraft gunner. Every integral part of his vastly complicated gun mechanism must function perfectly or he won't get that enemy plane before it looses its deadly load. When peace comes, accuracy will be *your problem too.*

In the postwar world, there will be a tremendous pent-up demand for all kinds of goods, but just anything won't "go." War has taught America to appreciate precision; your products will have to be good *—better than ever before.*

Kobe's part in helping you attain this end will be the manufacture of Master and Reference Gages of hitherto undreamed of perfection. New types of gages–new uses for gages–new standards of gage accuracy. The lessons Kobe has learned in licking wartime gage problems will be turned directly to your advantage.

The full story can't be told yet, but a talk right now with your nearest Kobe representative will prove to you that Kobe postwar gages will be well worth waiting and planning for.

KOBE

Master and Reference GAGES

KOBE, INCORPORATED
3040 East Slauson Avenue • Huntington Park, California

NEW! NEW! NEW!

SINE BAR MILLING TABLE

FOR ALL ANGLE MACHINING

•

TILTS IN EITHER DIRECTION

•

ADAPTABLE FOR USE ON MILLING MACHINES, PLANERS, BORING MILLS, ETC.

•

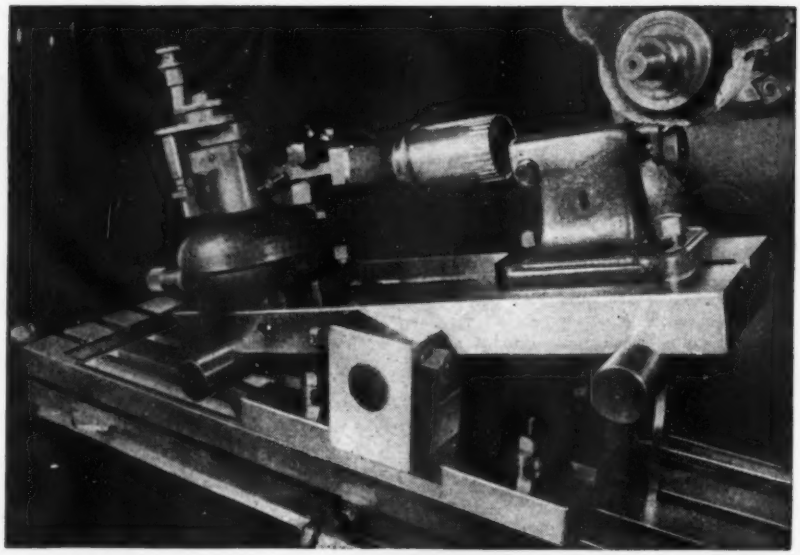
ENABLES YOU TO DO WORK NOW REQUIRING FAR MORE EXPENSIVE MACHINES

•

CUTS SET-UP TIME

•

TWENTY INCH SINE BAR CONSTRUCTION INSURES ACCURATE SETTING OF ANY ANGLE UP TO FORTY-FIVE DEGREES IN EITHER DIRECTION



View showing index head and center mounted on this fixture for milling slots in cylinder at a multiplicity of angles. This set-up eliminates the necessity of making special riser blocks to mount index centers

ORDNANCE GAUGE CO. 4080 Frankford Ave., Philadelphia 24, Pa.

TORNADO WRITING TOOLS and ETCHERS

TORNADO Electric Writing Tool. Used for marking everything. Easily portable anywhere.

Protect Valuable Tools!

TORNADO Electric Writing Tools and Etchers mark everything of value that might be lost, misplaced or stolen. TORNADO Writing Tool marks brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

TORNADO Electric Etcher marks iron, steel and steel alloy products. Burns permanent identification on various types of tools, dies, gauges, plates, gears, etc. Protects your valuable tools and other portable equipment!

WRITE FOR COMPLETE DETAILS

BREUER ELECTRIC MFG. CO.
5084 N. Ravenswood Ave., Chicago

DON'T GUESS! TEST R.P.M.

With a MODEL "J" **HAND TACHOMETER**

Triple Range:
300— 1200 R.P.M.
1000— 4000 R.P.M.
3000—12000 R.P.M.

RUGGED-RELIABLE-CONTINUOUSLY INDICATING TYPE

WRITE FOR BULLETIN #706

HERMAN H. STICHT CO. INC.
27 PARK PLACE NEW YORK, N. Y.

A.B.C. DRILL JIG BUSHINGS

Prompt Shipment from Stock

Of hardened, ground and finely finished tool steel and made to closest precision in following types:

A.S.A. STANDARD

Head Press Fit
Headless Press Fit
Headless Liners
Fixed Renewable
Slip Renewable

Also—a complete line of accessories carried in stock.

Write for Catalog No. 243

ACCURATE BUSHING CO., 40 North Ave., Garwood, New Jersey

A RECORD OF ACHIEVEMENT

TANTUNG
Blue Streak
SHELL END MILLS

FIVE SIZES
2¼" 2½" 3" 3½" 4"
DIAMETERS

COMPARATIVE CUTTING PERFORMANCE

	HIGH-SPEED STEEL	TANTUNG BLUE STREAK
S. F. M.	80	145
R. P. M.	76	136
FEED	3½"	5½"
DEPTH OF CUT	¼"	¼"
PIECES PER GRIND	2	16

MATERIAL CUT: Hard Nickel-Chrome-Molybdenum-Steel. Machine: Kearney & Trecker, Model K, 7½ HP. A coolant was used. Conventional cut.

YOU CAN GET THE SAME RESULTS! Tantung is easy to sharpen. Easy to operate. Use same technique as for high-speed steel cutters, only increase RPM and FEED. Write for Bulletin V-R 338.

Sold and Serviced by

VASCOLOY RAMET CORPORATION

4506

NORTH CHICAGO, ILLINOIS • SALES & SERVICE IN PRINCIPAL CITIES

FOR BETTER PRODUCTION IN '45

VARD would like to have you look over this array of precision gages which we are making for your 1945 needs.

VARD Acme Thread Plug gages in sizes from No. 4 to 6-in. diameter.

VARD Threaded Plug Gages, made in all standard and many special thread forms.

VARD Annular Threaded Plug Gages, available in sizes to 12-in. diameter.

VARD Pipe Plug Gages comply with American Gage Design standards and AN-GGG-P-363.

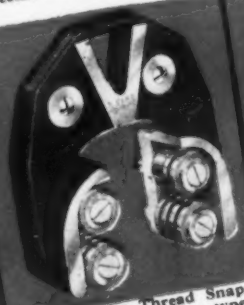
VARD Cylindrical Plug Gages. Sizes from .029 to 6-in. diameter. XX, X, Y, or Z tolerance.

VARD Acme Thread Ring Gages, in standard Acme or Special Thread forms.

VARD Threaded Ring Gages are ground in National, Metric, and other standard thread forms.

VARD Annular Ring Gages, for checking external threads made in sizes up to 12-in. I.D.

VARD Pipe Ring Gages are made to AN-GGG-P-363 specifications, as to types and tolerances.



VARD Acme Thread Snap Gage with John-Sons type rolls. Made to check Acme threads in diameters from ¼-in. to 13-in.

VARD Model VC Roll Thread Snap Gage. Rolls made to check threads from No. 0 NF to No. 14-20 NS.

VARD Model VE or VF Roll Thread Snap Gages. Are obtainable in all pitches. Check right or left-hand threads.

The VARD 6-in. Vernier Caliper measures the inside, outside and depth dimensions on one scale.

VARD Gages are manufactured in one of the finest precision plants in the country. A corps of experienced gagemakers work in controlled temperature on exact machinery to produce high quality instruments. The most precise testing and checking apparatus is available to assure accuracy of our work.

For complete information on VARD products, call your VARD Distributor or write for your copy of the VARD Gage Catalog.

VARD INC.

PASADENA 8, CALIF.

ARMY ★ NAVY ★★

OUTSTANDING PERFORMANCE

BARBER-COLMAN

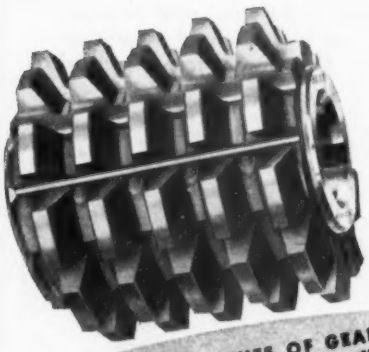
HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

HOBS

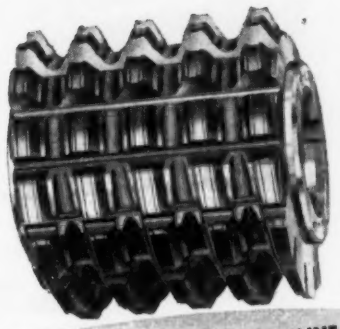
Illustrated here are a few examples of the various types of Hobs manufactured by Barber - Colman Company, together with brief indications of the outstanding performance they can deliver. Additional information will be supplied upon request.

A distinctive feature of all B-C Hobs is Specialized Engineering which provides careful control of proper tooth form, material, heat treatment, tolerances, and finish to assure maximum precision and performance. Because of our broad engineering experience in analyzing many special applications, B-C Hobs have been the answer to many difficult hobbing problems.

Why not bring your 1945 Cutting Tool Files up to date by writing today for a copy of our complete Hob Catalog.

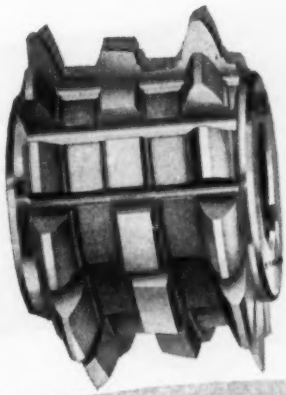


"9,120 LINEAL INCHES OF GEAR TOOTH PER HOB SHARPENING IN HEAT TREATED HY-TEN 84 STEEL, 50-53 SCLEROSCOPE."

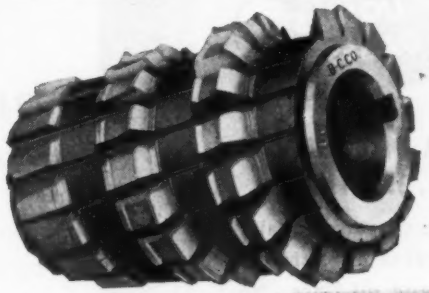


"16,593 LINEAL INCHES OF SPLINE PER HOB IN HEAT TREATED 1045 STEEL, 269-321 BRINELL."

"AXLE PINIONS, 16 TEETH 4.257/5 PITCH 1⅝" FACE, HOBBED IN 4820 STEEL, 132 PIECES PER GRIND."



"2,274 INCHES PER HOB SHARPENING OF ACCURATE DEEP KEY SLOTS WITH PARALLEL SIDES AND SHARP CORNERS."

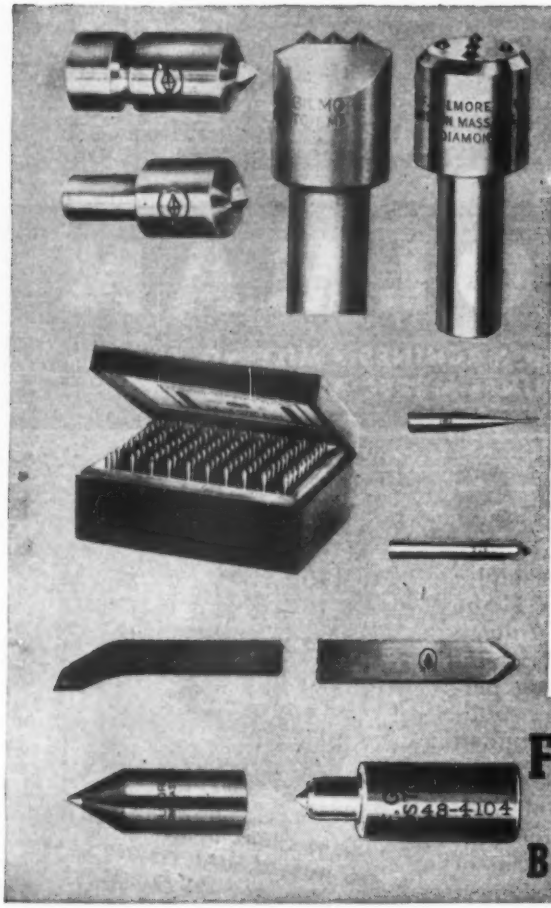


"1260 INCHES OF TAPER SPLINE HOBBED IN HEAT TREATED NE8720 STEEL 38-43 ROCKWELL, 120 PIECES PER GRIND."

Accurate! *Dependable!*

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS



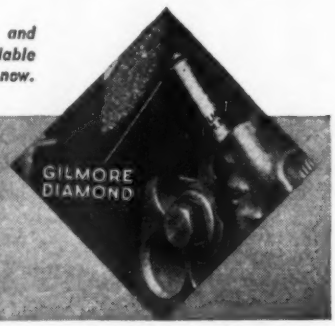
GILMORE
DIAMOND TOOLS

Meet today's exacting requirements for truing precision grinding wheels

Gilmore facilities include not only an adequate supply of rough diamonds but also a complete, fully equipped modern plant for tool making and diamond cutting. Careful selection of diamonds combined with long experience in mounting diamonds for highly specialized wheel truing use, enable Gilmore to render an invaluable complete service to the metal working industry.

Gilmore Diamond Tools include mountings for hand and machine wheel truing, needle point diamond tools for use on wheels used in grinding taps, threads, gages, small contours, etc. and tools for truing specially formed grinding wheels.

Complete information on the Gilmore line and service is contained in illustrated folder available promptly on request. Send for your copy now.



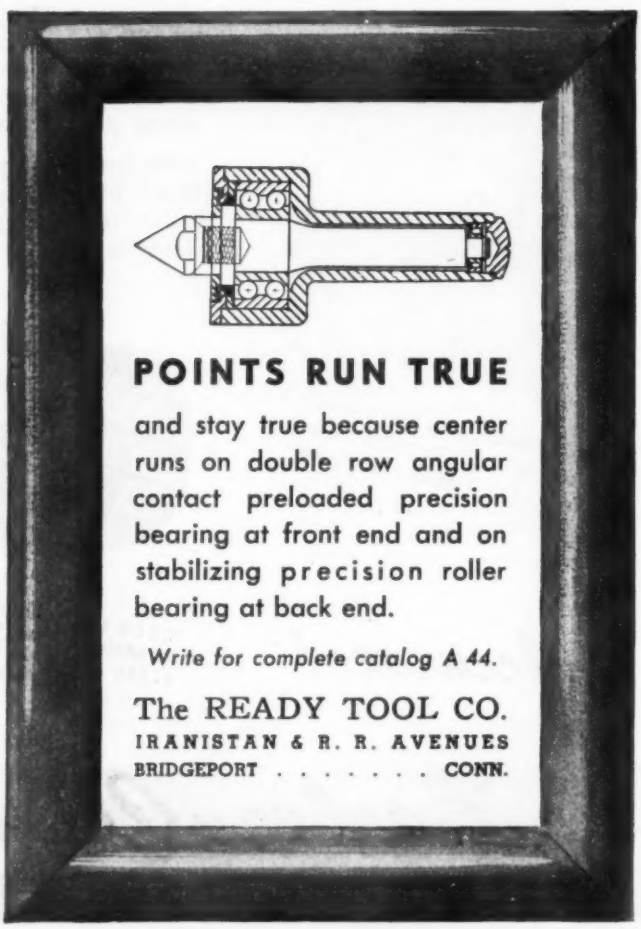
F. F. GILMORE & CO.
285 Columbus Ave.
BOSTON, MASS.

and THAT OPERATES UNDER PRESSURES UP TO 150 lbs. PER SQ. INCH?

• This new lightweight shut-off valve operates equally well in either gas or liquid lines, has free unrestricted flow, is adaptable to all types of fuel and oil lines. No metal-to-metal contact, positive sealed with "O" type seal rings. It's accurately indexed to 90°, 180°, 270° and 360°. Simple in construction—it can be supplied in all styles and sizes for use as a drain cock, shut-off or selector valve in water, fuel or hydraulic systems. For complete information, write engineering department—indicate use or application desired.

Whittaker

WM. R. WHITTAKER CO., LTD., 971 NORTH CITRUS AVENUE
LOS ANGELES 38, CALIFORNIA

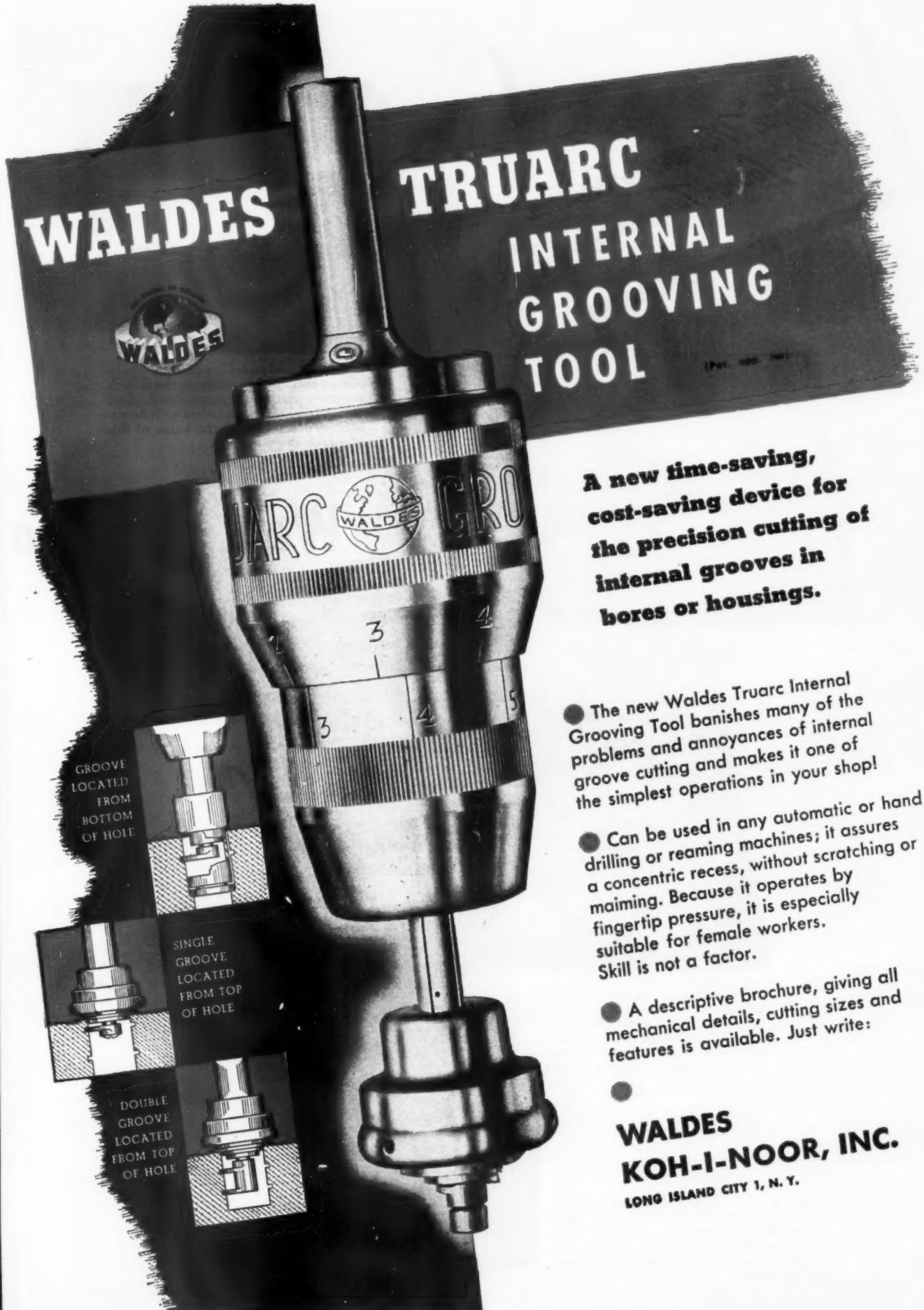


POINTS RUN TRUE

and stay true because center runs on double row angular contact preloaded precision bearing at front end and on stabilizing precision roller bearing at back end.

Write for complete catalog A 44.

The READY TOOL CO.
IRANISTAN & R. R. AVENUES
BRIDGEPORT . . . . . CONN.



A new time-saving, cost-saving device for the precision cutting of internal grooves in bores or housings.

● The new Waldes Truarc Internal Grooving Tool banishes many of the problems and annoyances of internal groove cutting and makes it one of the simplest operations in your shop!

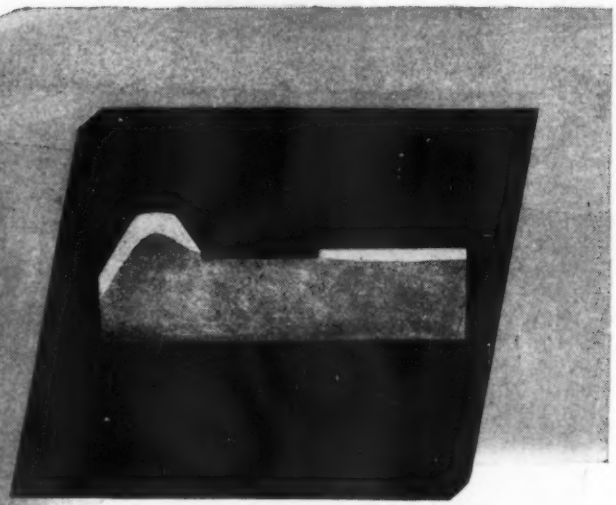
● Can be used in any automatic or hand drilling or reaming machines; it assures a concentric recess, without scratching or maiming. Because it operates by fingertip pressure, it is especially suitable for female workers. Skill is not a factor.

● A descriptive brochure, giving all mechanical details, cutting sizes and features is available. Just write:

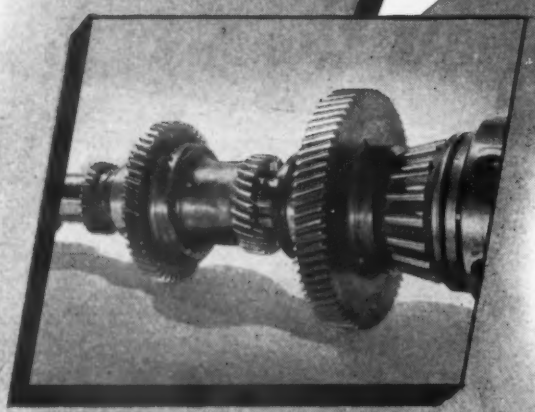
●

WALDES KOH-I-NOOR, INC.
LONG ISLAND CITY 1, N. Y.

These Monarch Features mean Lower Turning Costs

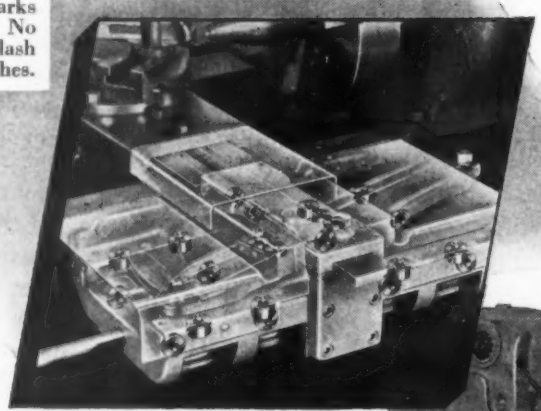


Flame-hardened bedways—help reduce costs by maintaining the lathe's accuracy over many years of use. More than 18,000 Monarch lathes with flame-hardened beds prove the value of this Monarch development.

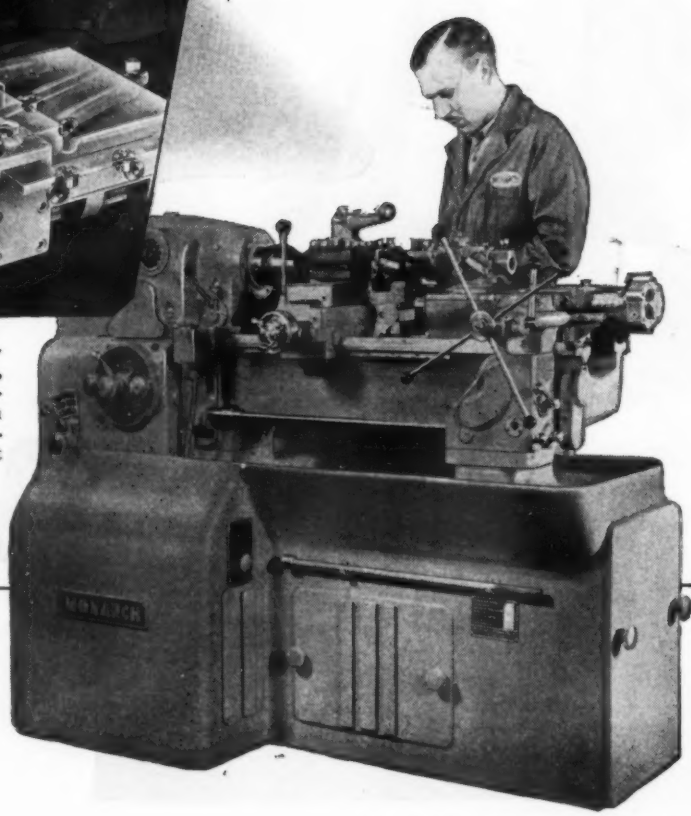


Helical gears—adopted by Monarch in 1924. Eliminate noise, chatter and gear tooth marks from finished work. No lost motion or backlash between the jaw clutches.

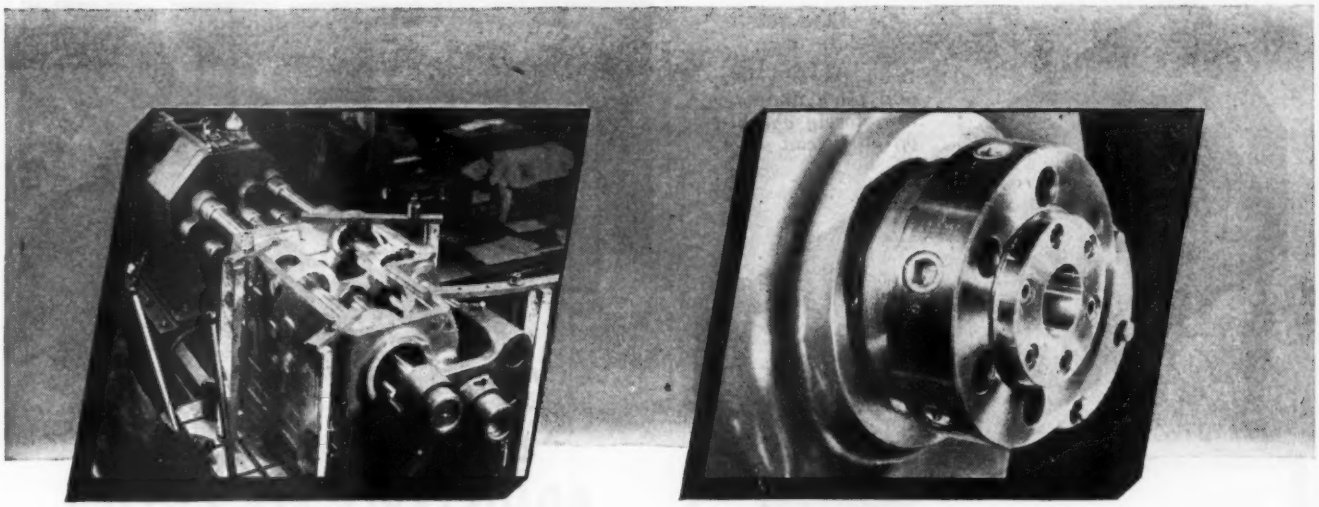
We'd like to



Ball-bearing taper attachment—turns or bores accurate, smooth tapers under all conditions. Permits heavier cuts than with conventional type of attachment. Nothing to wear or get out of adjustment.



Monarch 10" hi-speed production lathe—provides unmatched speed and accuracy for the production of many small parts. Spindle speeds up to 5,000 rpm, or higher, may be obtained with this Monarch lathe.



Inside turning—rough and finish boring of fifteen holes in headstock are done at one setting on this Monarch lathe, greatly reducing time required and assuring precise accuracy in location of holes.

Camlock spindle nose—retains accuracy throughout life of the lathe. Saves much time in attaching and removing chucks and plates, and holds them rigidly to the spindle.

talk to your Cost Department

● You've got your job cut out for you, when you get the go-ahead on peacetime production. We can't help you on raw material costs or wage rates. But we can show you how modern Monarch turning machines will deliver more perfectly finished parts from your raw material—and how you can turn more parts per man-hour.

You can get an idea of how Monarch can do this, from the accompanying pictures. But they are only a start. Our sales engineers can demonstrate many other devices and practical short cuts that have been time-proved on a wide variety of turning work. In the war product program, especially, Monarch lathes have established new timesaving records.

Getting more and better work out of your machine tools is one way to make your products available to more people at lower cost. It's a necessary step toward American industry's peacetime goal—to permit American workers to earn more, buy more, have more.

For this cost-reducing assistance, ask our nearest branch office or sales agency.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

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622 W. Washington Blvd.
Phone: Randolph 4295

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Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

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635 Industrial Office Bldg.
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Representatives in Principal Cities

Monarch Saves Time

Lead, thread angle, and pitch diameter are closely checked on all thread plugs.

Rely On Republic Gage

As Your Prime Source of Supply — Our completely equipped, temperature controlled inspection department, where all gages are rigidly inspected for any errors; skillfully ground threads, lapped to give you added wear; and the use of *only* the finest tool steels are factors which place Republic Gage Co. first with buyers and users of top quality thread plugs, cylindrical plugs, and ring gages.

Carefully consider these vital facts when next you order gages, then order from Republic Gage with confidence.

REPUBLIC GAGE CO.

2228 FENKELL AVENUE
DETROIT 21, MICH.

FOR GAGES OF LONG LIFE ACCURACY

Major diameters are relieved on Republic rings, affording many economical re-lappings and re-settings on each ring.

Smooth Chatterless Operation

WITH

CC Clark

ADJUSTABLE FLY CUTTER

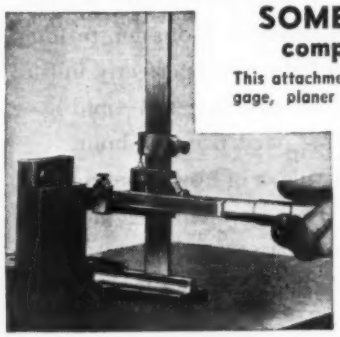
Two models cut quick, clean, accurate holes within a 2½" to 10" range, up to 1" thick. Cross-section of cut has appearance of letter "W" with each blade taking out its own side. Unique angles at which blades are held and new grinding technique on high-speed steel cutting blades prevent chatter. Shank is heat-treated. Removable pilot, hardened and ground, permits use of lead drills.

Write for complete catalog. **AM-2-FC**

CLARK CC CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD · BEVERLY HILLS, CALIFORNIA



SOMERSET LAYOUT

complete set $16.00

This attachment quickly converts your height gage, planer gage or gage blocks into a tool that can be compared to a jig borer. With it you can layout work easily and accurately. Designed to mark off vertical distance from a plane surface and by the use of the inserted center punch holder, the locating of holes for jigs, fixtures and dies can be accurately obtained. Write for complete details.

SOMERSET TOOL COMPANY

232 Virginia Street — **Hillside, New Jersey**

RANDALL and STICKNEY Dial Gauges and Indicators

Model C

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2⅛ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

RANDALL & STICKNEY
Waltham 54, Mass., U. S. A.
Makers of Dial Gauges Since 1885

HIGH PRODUCTION

ON PRECISION MILLING JOBS WITH THE U. S. MULTI-MILLERS

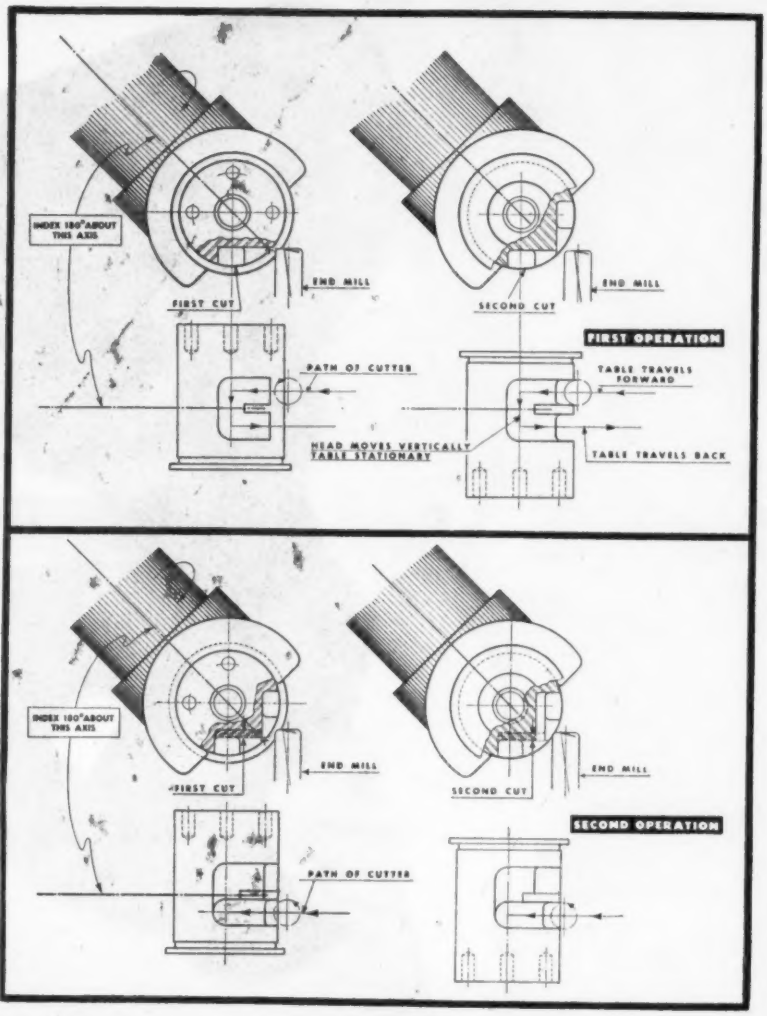
Directly below is a photograph of a part showing an intricate milling cut. This particular job was handled to advantage on U. S. Multi-Millers. Two operations (each operation involving two cuts) are required to complete the piece.

The first operation is performed on an MM-1-5-2 U. S. Multi-Miller equipped with a Cam-controlled Automatic Table Feed, Cam-controlled Automatic Vertical Feed of the Spindle Head, and Special Indexing Fixture. An illustration of the MM-1-5-2 U. S. Multi-Miller showing the arrangement for vertical feed of the spindle head is shown at the lower left of this page.

The second operation is handled on an MM-1-6 U. S. Multi-Miller which does not include the automatic vertical feed of the spindle head. This machine is equipped with the same fixture used for the first operation.

The sequence of operations is given below, and the drawings at the right indicate the various steps.

This is just one of the many different types of milling operations which can be handled to advantage on the U. S. Multi-Millers. A complete description of the Multi-Millers is found on pages 2 through 7 of our General Catalog. Ask for your copy.



U. S. TOOL COMPANY, INC.
AMPERE (EAST ORANGE), N. J.

Builders of

U. S. MULTI-MILLERS, U. S. MULTI-SLIDES, U. S. AUTOMATIC PRESS ROOM EQUIPMENT, U. S. DIE SETS AND ACCESSORIES

1st CUT ON FIRST OPERATION

(Performed on MM-1-5-2 U. S. Multi-Miller)

1. Fast approach of table (with work fixture) to cutter.
2. Cut at correct feed to proper longitudinal depth.
3. Table motion automatically stops and spindle head automatically descends to perform the vertical portion of the cut.
4. Motion of spindle head stops and table returns at proper cutting feed until cutter clears work.
5. Rapid return of table to starting position.

2nd CUT ON FIRST OPERATION

(Performed on MM-1-5-2 U. S. Multi-Miller)

1. Fixture is indexed end for end around axis shown in drawing.
2. Cycle given above for first cut is repeated.

1st CUT ON SECOND OPERATION

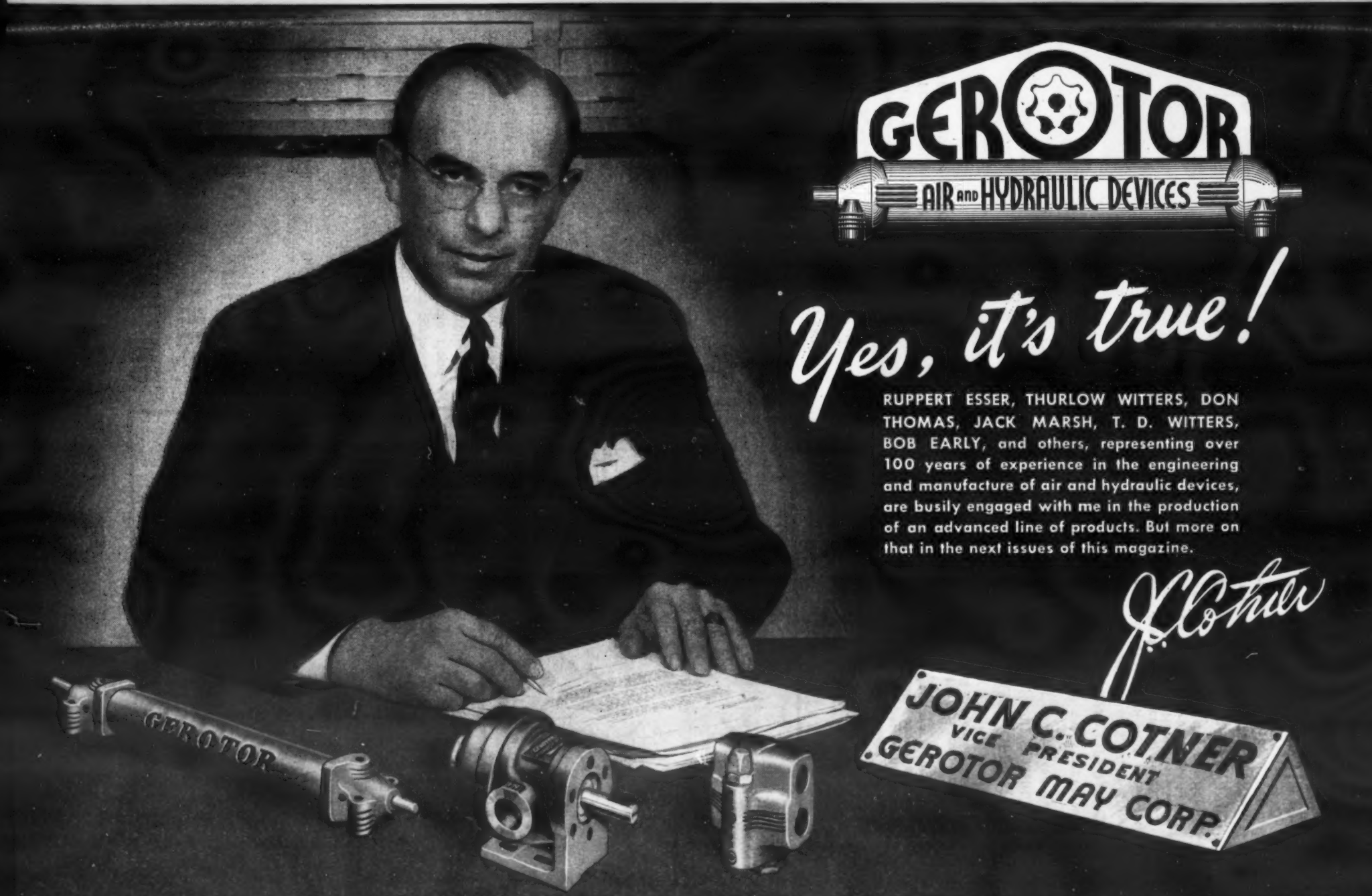
(Performed on MM-1-6 U. S. Multi-Miller)

1. Fast approach of table (with work fixture) to cutter.
2. Cut at proper feed to longitudinal depth.
3. Return at same feed until cutter clears work (returning at same feed eliminates cutter marks).
4. Rapid return of table to starting position.

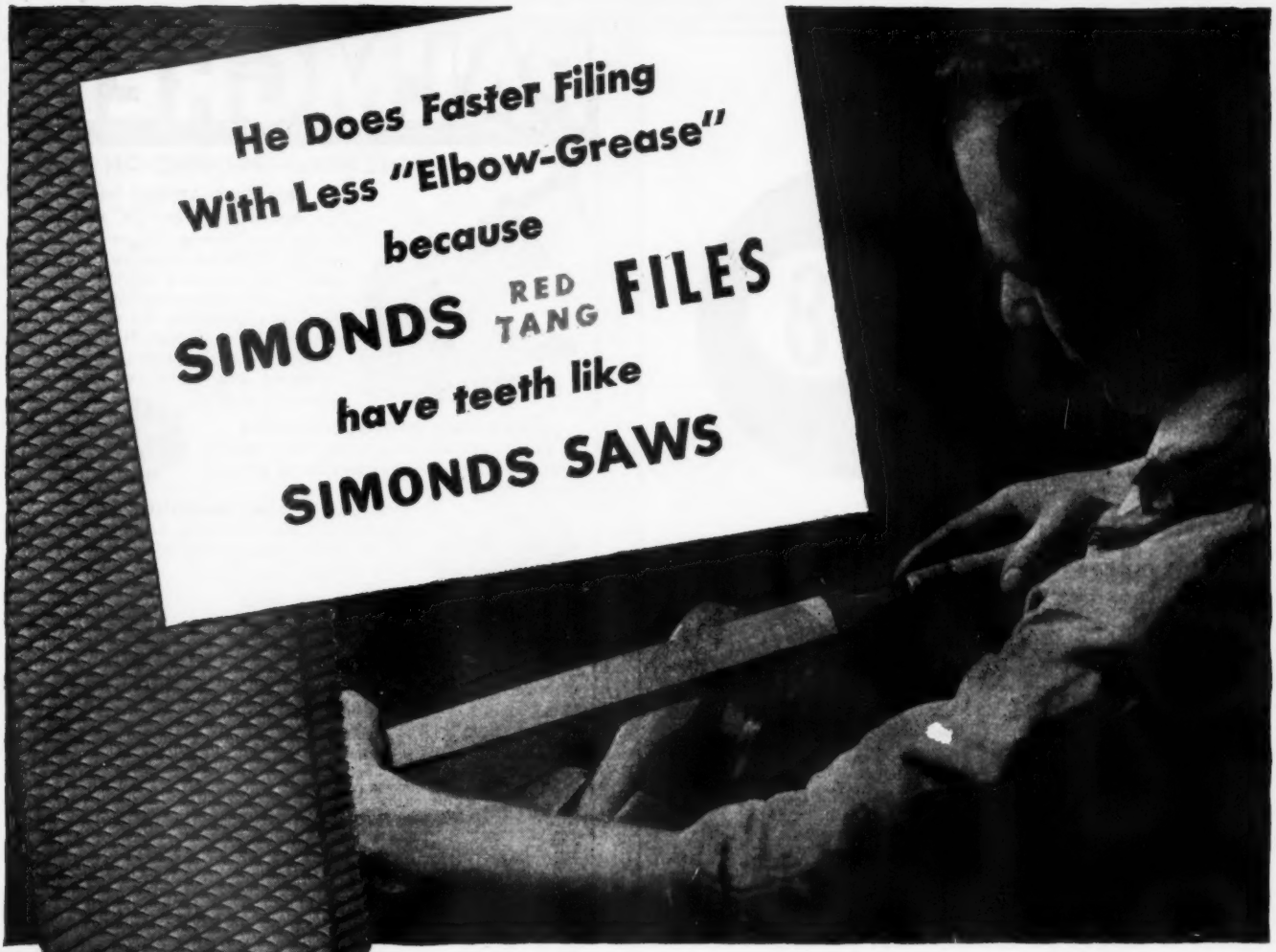
2nd CUT ON SECOND OPERATION

(Performed on MM-1-6 U. S. Multi-Miller)

1. Index fixture end for end around axis shown in drawing.
2. Cycle as given above for first cut repeated.


GEROTOR
AIR AND HYDRAULIC DEVICES
Yes, it's true!
RUPPERT ESSER, THURLOW WITTERS, DON THOMAS, JACK MARSH, T. D. WITTERS, BOB EARLY, and others, representing over 100 years of experience in the engineering and manufacture of air and hydraulic devices, are busily engaged with me in the production of an advanced line of products. But more on that in the next issues of this magazine.
J. C. Cotner
JOHN C. COTNER
VICE PRESIDENT
GEROTOR MAY CORP.
GEROTOR

GEROTOR MAY CORP., Baltimore, Md. — LOGANSPORT, IND.



He Does Faster Filing
With Less "Elbow-Grease"
because
SIMONDS RED TANG FILES
have teeth like
SIMONDS SAWS

Chips roll easily off the teeth of Simonds Files, just as they do from the bits of machine tools . . . long, spiral chips that mean smooth, easy cutting instead of scraping that leads to quick fatigue.

And Simonds *Red Tang* File teeth are not only fast-cutting . . . they're long-lived as well, because they're designed and shaped like the teeth of Simonds Metal-Cutting Saws. So you can bank on *Red Tang* Files to cut more metal with each stroke . . . and to stay sharp longer. These files are made in only one quality, A-1. Order them from your Industrial Supply Distributor, or from the nearest Simonds office:

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash.

SHORTEN THE WAR . . . BUY BONDS

SIMONDS
SAW AND STEEL COMPANY
FITCHBURG, MASSACHUSETTS

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

Behind the eight ball with Production Problems?

Because "eight balls" loom large in front of every production man at times . . . SYNCRO has developed a specialized service to remove such obstacles. SYNCRO specializes in tough engineering production problems and in the manufacture of precision machined tool products for Victory and after Victory. Consult SYNCRO now—without obligation.

SYNCRO DEVICES, INC.
FERNDALE 20, MICHIGAN

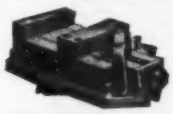
SYNCRO

Manufacturers of Precision Machined Products

PALMGREN

ANGLE—DRILL PRESS—PRODUCTION VISES

No. 000 ANGLE VISE
Mounted on Swivel "M" Base
For Drilling, Milling, Grinding, Filing, Fitting, Etc. Permits setting up of angle work accurately and quickly without clamps, wedges or make-shift methods. Accurately graduated for all angles, once set it stays locked. Precision machined of semi-steel casting. Jaws are hardened steel—plain or grooved. Sizes 1½" to 8".

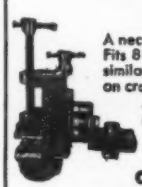


HEAVY DUTY PRODUCTION VISES
For fast, heavy work. Adjustable cam locking lever. Movable jaws, hardened and ground. Sizes 3" to 8" Jaws.

FLANGED MILLING MACHINE VISE
Clamps to table of milling machine, grinder, etc. For heavy work. Has hardened and ground jaws 6" wide, 2" deep.

DRILL PRESS VISES
For every purpose. Accurately machined, best semi-steel castings. Long bearing adjusting screw. Jaws hardened steel—plain or grooved. Sizes 1½" to 4".

No. 250 MILLING ATTACHMENT VISE
MAKES MILLING OPERATIONS POSSIBLE ON LATHE



A necessary fixture for small shops and emergency work in large shops. Fits 8"-9"-10" South Bend, Atlas, Craftsman, Sheldon or other lathes of similar sizes. Has graduated vertical angle adjustments. Easily mounted on cross slide and held by one T-Slot bolt. PALMGREN VISE has 2½" Jaws opening full 2½". Depth Jaw 1-7/16", one plain and one grooved jaw for holding round pieces. Height 10½", Price $24.75.

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8354 South Chicago Avenue Chicago 17, Ill.

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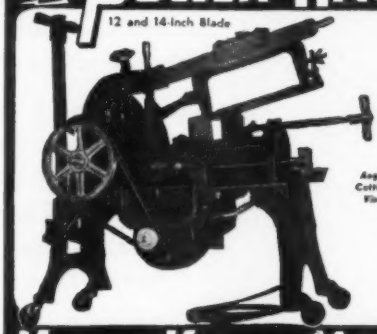

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PORTABLE
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READY TO WORK
STURDY
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PRECISION DOWEL PINS
STANDARD AND .001 OVERSIZE

Hardened and Precision ground to a tolerance of ±.0001 of an inch. Available in .001 oversize for repair or renewal work.

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Again-

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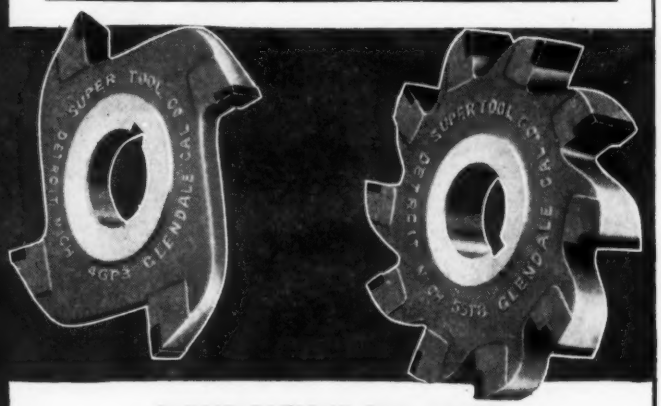
Milling Cutters

SUPER has done it again! For the second time in less than a year, prices on Super Carbide Tipped Milling Cutters have been reduced! And it is a big reduction, too . . . again made possible because of an increased demand for these fast, economical cutters that has resulted in increased production and greater manufacturing economies. Take a look at the new low prices shown in the charts at the right . . . then place your order TODAY for these Super Carbide Tipped Milling Cutters that now, more than ever, will step down your costs while they are stepping up your production.

SPECIFICATIONS AND PRICES

Cutters for Cast Iron, Brass, Bronze, Aluminum, Etc.

Tool Order No.	Diameter	Width	Hole	No. of Teeth	Price Each
3-GP-1	3"	1/4"	1"	4	$ 9.75
3-GP-2	3"	5/16"	1"	4	9.75
3-GP-3	3"	3/8"	1"	4	10.00
3-GP-4	3"	7/16"	1"	4	11.00
3-GP-5	3"	1/2"	1"	4	12.00
4-GP-1	4"	1/4"	1"	4	12.00
4-GP-2	4"	5/16"	1"	4	12.00
4-GP-3	4"	3/8"	1" or 1¼"	4	12.25
4-GP-4	4"	7/16"	1"	4	13.00
4-GP-5	4"	1/2"	1" or 1¼	4	13.50
4-GP-6	4"	9/16"	1"	4	15.00
4-GP-7	4"	5/8"	1" or 1¼"	4	16.00
4-GP-8	4"	3/4"	1" or 1¼	4	17.00
4-GP-9	4"	7/8"	1" or 1¼"	4	25.00
5-GP-4	5"	7/16"	1¼"	6	17.25
5-GP-5	5"	1/2"	1" or 1¼	6	17.50
5-GP-6	5"	9/16"	1¼"	6	18.00
5-GP-7	5"	5/8"	1¼"	6	18.25
5-GP-8	5"	3/4"	1" or 1¼"	6	20.50
5-GP-10	5"	1"	1¼"	6	27.50
6-GP-5	6"	1/2"	1" or 1¼"	6	21.00
6-GP-7	6"	5/8"	1¼"	6	22.00
6-GP-8	6"	3/4"	1" or 1¼"	6	26.00
6-GP-10	6"	1"	1¼"	6	30.00
7-GP-8	7"	3/4"	1¼"	8	30.00
7-GP-10	7"	1"	1¼"	8	33.00
8-GP-8	8"	3/4"	1¼" or 1½"	8	35.00
8-GP-10	8"	1"	1¼" or 1¼"	8	38.50



SPECIFICATIONS AND PRICES

Cutters for Use in Steel

Tool Order No.	Diameter	Width	Hole	No. of Teeth	Price Each
3-ST-1	3"	1/4"	1"	6	$14.00
3-ST-2	3"	5/16"	1"	6	14.00
3-ST-3	3"	3/8"	1"	6	14.25
3-ST-4	3"	7/16"	1"	6	15.50
3-ST-5	3"	1/2"	1"	6	16.25
4-ST-1	4"	1/4"	1"	8	17.00
4-ST-2	4"	5/16"	1"	8	17.75
4-ST-3	4"	3/8"	1" or 1¼"	8	18.25
4-ST-4	4"	7/16"	1"	8	18.75
4-ST-5	4"	1/2"	1" or 1¼"	8	19.50
4-ST-6	4"	9/16"	1"	8	20.75
4-ST-7	4"	5/8"	1" or 1¼	8	21.50
4-ST-8	4"	3/4"	1" or 1¼"	8	22.00
4-ST-9	4"	7/8"	1" or 1¼"	8	30.00
5-ST-4	5"	7/16"	1¼"	10	22.50
5-ST-5	5"	1/2"	1" or 1¼"	10	23.00
5-ST-6	5"	9/16"	1¼"	10	25.50
5-ST-7	5"	5/8"	1¼"	10	26.50
5-ST-8	5"	3/4"	1" or 1¼"	10	30.00
5-ST-10	5"	1"	1¼"	10	35.00
6-ST-5	6"	1/2"	1" or 1¼"	12	33.75
6-ST-7	6"	5/8"	1¼"	12	35.00
6-ST-8	6"	3/4"	1" or 1¼	12	37.00
6-ST-10	6"	1"	1¼"	12	40.00
7-ST-8	7"	3/4"	1¼"	12	39.00
7-ST-10	7"	1"	1¼"	12	45.00
8-ST-8	8"	3/4"	1¼" or 1½"	12	40.00
8-ST-10	8"	1"	1¼" or 1½"	12	50.00

Variations from above specifications subject to special quotation.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California

New Universal Grippits and Plungers Speed Production, Increase Accuracy

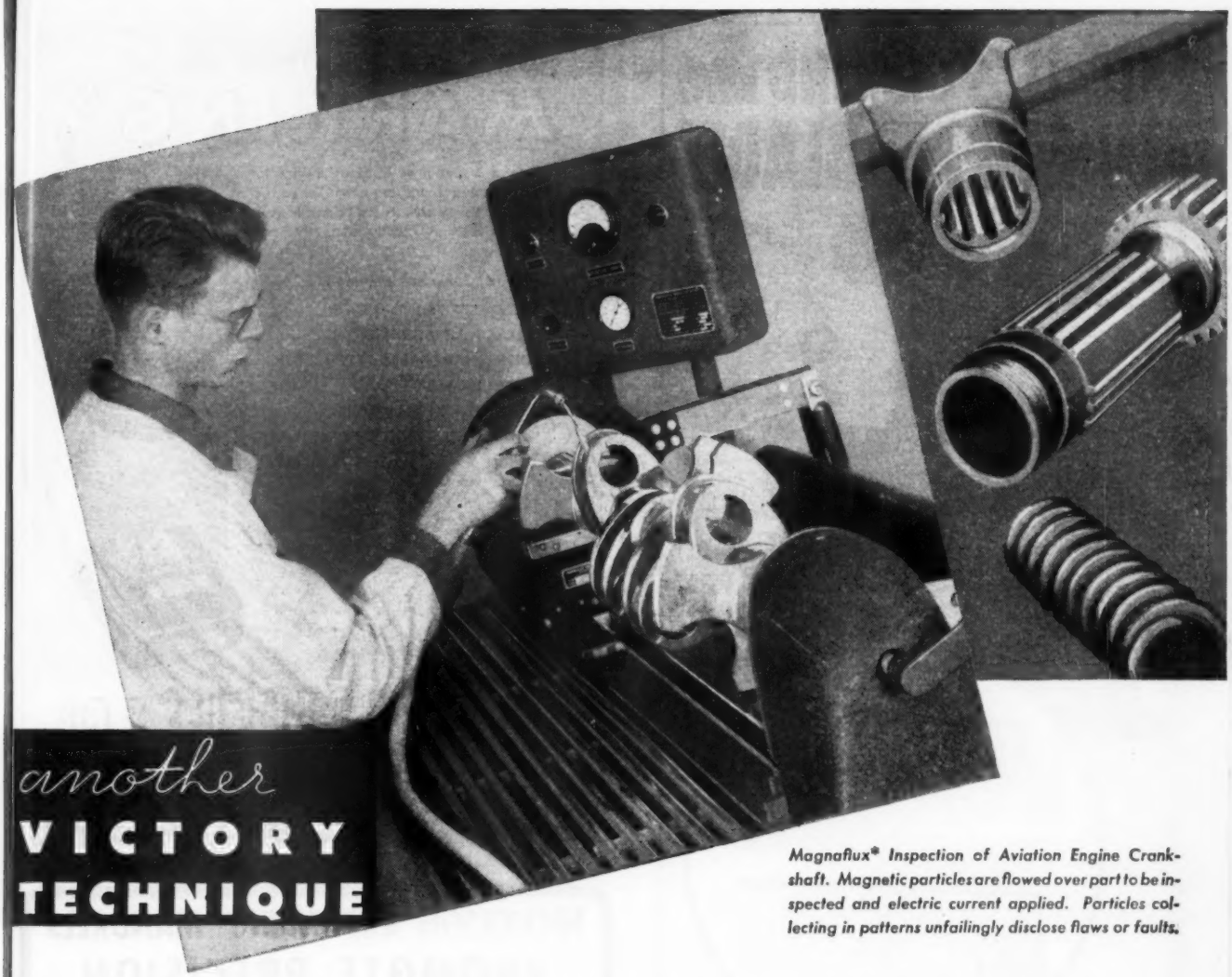
Left: Universal Plungers are available in three sizes from ½" to 1" diameter.

Above: Universal Grippits are available in four sizes with diameters from ½" to 1".

Universal Grippits reduce time-wasting delays in set-up operations because, inserted through a tapped hole in the jig or fixture, they clamp the work quickly and securely with only one eighth turn. Universal Plungers for multi-stationed tools are standardized in three sizes, ready to be installed at approximately one-fourth the cost of special-made plungers. Both Universal Grippits and Plungers cut production costs, and both are made with the same care and exacting accuracy as are the drill bushings, collet chucks, and other fine Universal products. Write for full information on any of the Universal tools illustrated here.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions



another
VICTORY TECHNIQUE

Magnaflux Inspection of Aviation Engine Crankshaft. Magnetic particles are flowed over part to be inspected and electric current applied. Particles collecting in patterns unfailingly disclose flaws or faults.*

MAGNETIC TATTLE-TALE PROVES METAL FRIEND OR FOE

Uncle Sam's fighting men have proved themselves invincible before any known adversary. But hidden foes could wreak terrible havoc. Should equipment fail in a crucial moment, personal bravery might mean only personal sacrifice.

To guard against this possibility, Uncle Sam's Army and Navy Air Services absolutely require that all highly stressed magnetizable parts in aircraft and aircraft engines be subjected to Magnaflux* inspection. Thus friend is proved before foe can harm.

In addition, Magnaflux* is widely used for the inspection of welds in gun mounts, pressure piping on shipboard and in power plants, for the inspection of heat treated parts, projectiles, and on railroads and in automotive manufacturing fields.

Magnaflux* is only one of the many techniques that are insuring victory by assuring the best and greatest production the world has imagined.

Such Victory Techniques in metallurgy and in all phases of production can be vital to you in peacetime operation if a competitive position is to be achieved. *You must be alert to learn them.* And your Lindberg representative is eager to do his share to help you. Ask him about the new developments in brazing and in powder metallurgy with the new Lindberg furnaces; in the treatment of metals by heat in any form.

*Trade-Mark registered by Magnaflux Corporation

LINDBERG ENGINEERING COMPANY
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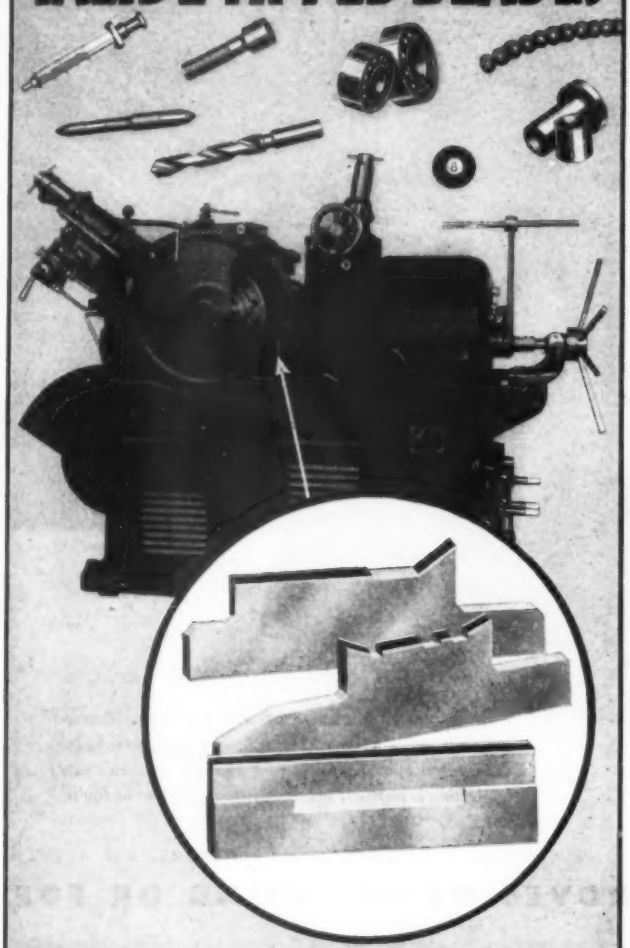
ARMY E NAVY

Lindberg FURNACES

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

CENTERLESS GROUND *with* TALIDE-TIPPED BLADES



Talide-Tipped Blades, with Tungsten Carbide wear strips, have become standard equipment for centerless grinding armor-piercing shot, shells, projectiles, bullet cores, aircraft parts and other ordnance material

The extra long life of super-hard Talide Blades, plus their natural ability to resist scoring and galling, have helped to increase the production of precision ground parts by eliminating down-time and rejects.

In the post-war period, Talide-Tipped Blades will be used to increase the production of lower cost roller bearings, fountain pens, cap screws, twist drills, bushings and a wide variety of shafts, spindles and screw machine products. Write for catalog 43-WP listing full particulars and prices.

TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION · YOUNGSTOWN, OHIO

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO

TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

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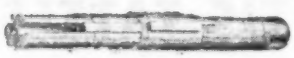
NICHOLSON *EXPANDING* MANDRELS PROMOTE PRECISION



And, secondly, they CUT COSTS . . . two big reasons why Nicholson Expanding Mandrels are recognized as "standard" in the nation's machine shops. Set of 19 does the work of 209 solid arbors, for all bores, ½" to 7". Two types, all sizes; singly or in sets. Prompt delivery. Bulletin 1043.

W. H. NICHOLSON & CO. • 114 OREGON STREET WILKES-BARRE, PA.

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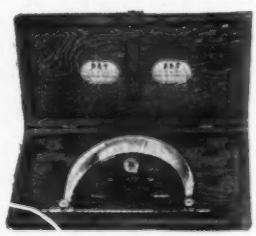
Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . . ***Write for Bulletin 200*** or outline your gaging problems.



• D & T Bow Micrometer 0 to 6 in. capacity

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. Milwaukee 14, Wisconsin

Gear Up YOUR GEAR FINISHING

Brushing Technique Illustrated Cut the Time on One Job from 2½ *HOURS* to less than 3 *MINUTES!*

THIS is the case history of one of America's greatest airplane engine manufacturers.

Rounding the edges of gear teeth, very vital, took a lot of time. In many cases, the job had to be done by hand. High-speed portable pneumatic tools were also used—but great dexterity was required, and even the most skillful worker found noticeable variations in his work. A moment of carelessness could easily ruin a costly gear.

Solution: Power-driven tampico brushes, used with the installation illustrated, bear *uniformly* against the various edges. They can be adjusted to suit the diameters of different gears, and tilted at any angle to cover all surfaces. Abrasive compound is held above each brush, applied to the wheel by a cam-operated device, driven by a separate small motor.

Isn't there an idea here for *you* to consider in connection with *your new products?*

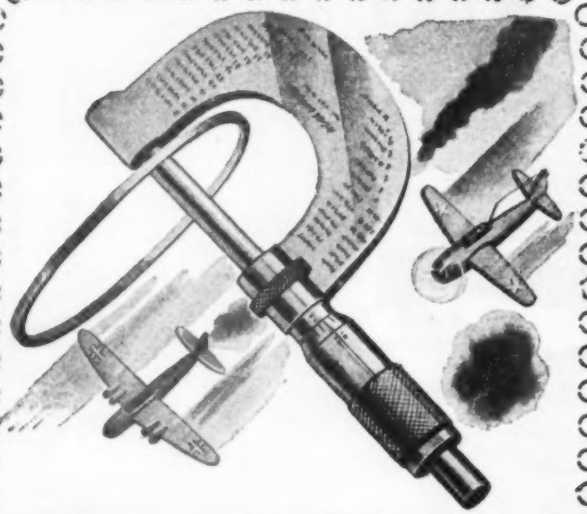
Whatever they are, *whether metal, plastic* or *fabric,* it will pay you to consider Osborn brushes and Osborn-developed brushing techniques—which can help you make your product look better, perform better and sell better, all at a lower unit cost.

Investigate without obligation. Contact Osborn and an expert field engineer will make a study of your operation or plans and submit specific recommendations.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY



PRECISION
where it counts!

The margin between victory and disaster to the fighter pilot depends upon that all important factor — precision. Likewise today's demands on marking equipment are for precision — plus speed. With a background of continuous pioneering and development since the beginning of this century, Noblewest equipment is today foremost in the field of high-speed precision metal marking. Our new catalog supplement No. 43 describes Noblewest Marking Machines and Methods that meet practically all requirements of industry. Write for it today.

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Marking specialists since 1904

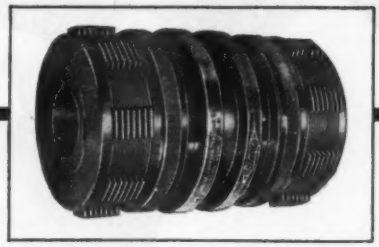
EAST HARTFORD, CONN.

MODEL 183

Designed for marking P & W Aircraft Engine piston rings where distortion of thickness must be held to within .001 of an inch. Will mark all sizes of rings up to 6" and can be retooled for marking other flat parts of uniform thickness at rapid production speeds.

MARK IT BEST WITH NOBLEWEST — NOBLEWEST IMPROVED MARKING DEVICES

"MAXITORQ"



The FLOATING DISC CLUTCH . . .

The **"MAXITORQ" FLOATING DISC** principle speeds and simplifies all clutch operations. No tools required for installation, adjustment or take-down. Discs ride free in neutral . . . "you can see between them" . . . no abrasion, excessive heat or drag. Engagement easily controlled by light pressure. Long wear, quiet, smooth performance.

SINGLE AND DOUBLE . . .
WET AND DRY TYPES

Made in capacities from ¼ to 5 H.P. at 100 R.P.M. Also in Pulley and Cut-off Coupling types.

MAXITORQ *floating* **DISC CLUTCH**

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SAFE OPERATION is profitable operation! Increased production always results when an operator feels safe.

Junkin safety guard equipped presses control the danger of torn, lacerated or smashed hands — eliminating lost man hours and unnecessary compensation costs.

Get "protection plus production" by using Junkin Safety guard. We will be glad to send you all of the facts without obligation.

JUNKIN SAFETY APPLIANCE CO. Inc.

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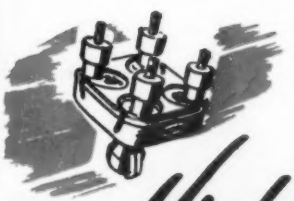
JUNKIN SAFETY GUARDS

THRIFTMASTER
Adjustable



THRIFTMASTER *Adjustable* Drillheads with 2 or more Adjustable Spindles are highly practical machine tools. Descriptive brochure on request.

High Production - Money Making

MULTIPLE SPINDLE DRILLHEADS

THRIFTMASTER PRODUCTS

DIVISION OF

ZIMMER-THOMSON CORPORATION

29-05 Review Avenue • Long Island City 1, New York

DUAL ADJUSTABLE

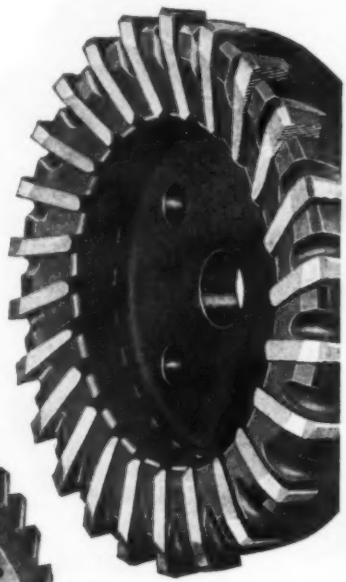
Inserted-Blade Milling Cutters

for the exacting needs of

WAR PRODUCTION

TAPERED, serrated blades fit into mating slots in the cutter body. There they are immovably held without wedges, pins or set screws—yet may be quickly removed. As the slots are at an angle to the body, when these blades are set out one or more serrations, as required for regrinding, both radial and axial adjustments occur at the same time *automatically!* This not only saves time in moving the blades out into line of wear, but actually results in 65% blade usability.

LONGER BLADE LIFE DUE TO AUTOMATIC RADIAL AND AXIAL ADJUSTMENTS



The new blades and cutter bodies are available for either roughing or finishing. In the roughing cutter (above) the blades are inserted radially into the body and shear into the work in the direction of feed. Major wear and adjustment are on the periphery, the face of the blade merely scraping the work just cut.

In the finish milling cutter (left) the blades are inserted into the periphery and are ground with a slight lead to produce a "skiving" cut. Here the major blade wear and major adjustment are on the face. A folder describing the "Dual Adjustable" principle will be sent on request.

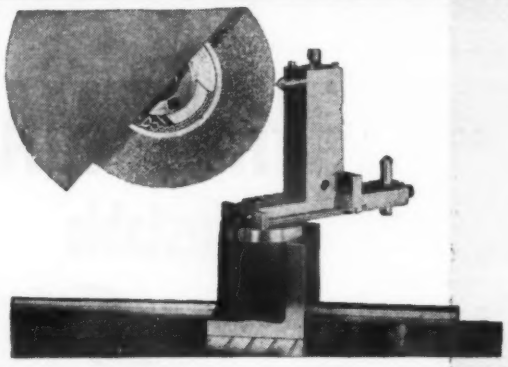
THE O K TOOL CO., SHELTON, CONN.

TRADE O K MARK **SYSTEM**

OF INSERTED-BLADE METAL CUTTING TOOLS

The "FORM-MASTER"

ANGLE & RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. diamonds and instrument case included. $150.00.

It readily produces: Any desired angle
Convex radii to 4" on 7" wheel
Concave radii to 7" on 7" wheel

Specifications: Base 3" x 3", height 8½"
Wheel capacity 10"
Angular travel 3"

For information or a demonstration CALL YOUR SUPPLIER

Manufactured by

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477 Main Street East Orange 1, N. J.

"PRECISION DRESSING TOOLS"

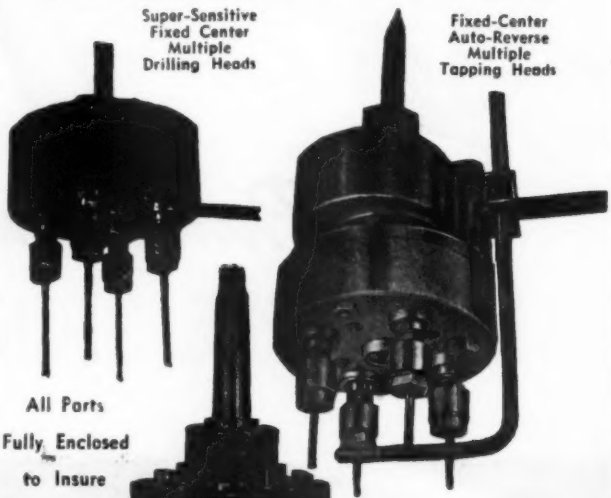
ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

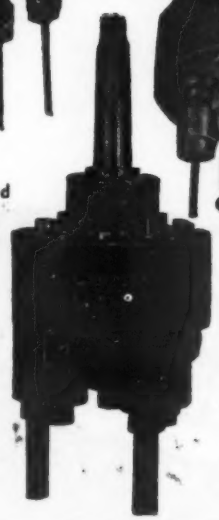
MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads



All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

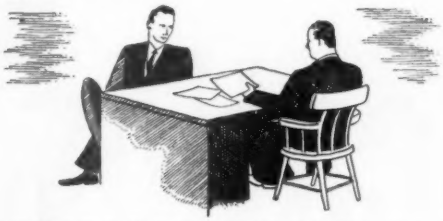


ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

NEW TAP, DEVELOPED FOR BOTTOMING HOLES IN STRINGY MATERIAL, SOLVES OLD PROBLEM

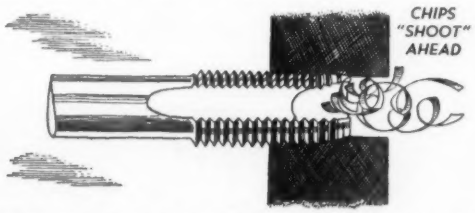
[A GTD SHOW-HOW REPORT]

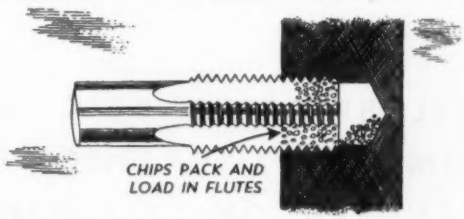
1 On a routine call at an aircraft factory, "Greenfield" distributor's salesman was told—in casual way—that production could be speeded up on a certain job except for traditionally poor performance of ordinary bottoming taps in threading blind holes in stringy materials.



2 Conversation was repeated to "Greenfield Man" in that territory who in turn took it up with "Greenfield" engineers at home office. In spite of fact that this was an accepted limitation of ordinary bottoming taps, "Greenfield" research laboratory tackled this old problem again.

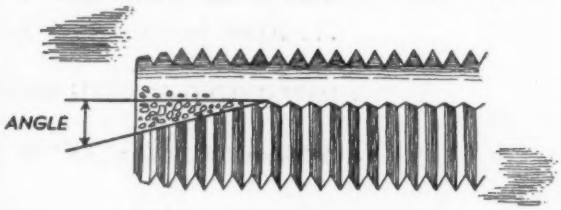
3 Experience showed that "Gun" tap with its clean shearing action was ideal for this material but that cutting angle which gives this shearing action shoots chips ahead of the tap, normally restricts use to through holes or blind holes with plenty of chip room at bottom.

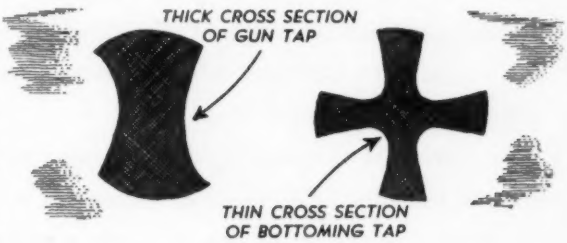




4 Action of ordinary bottoming taps tends to "load" chips in flutes, causing torn threads at bottom of holes when chips pack down; traditionally accepted as unavoidable. These taps are also somewhat more susceptible to breakage because of smaller cross-sectional metallic area than "Gun" taps.

5 "Greenfield" researchers working on theory that "Gun" shearing action combined with chip breaking action would solve this problem; finally developed a cutting angle on a bottoming "Gun" tap which gave desired result. Additional flute space at point of tap provided extra room for chip disposal.





6 New tap retained advantages of "Gun" tap's shearing cut and heavy cross-sectional metallic area for maximum strength, tap could cut full clean thread to bottom of hole. Tap breakage was reduced.

Results:

(1) Aircraft manufacturer found new "Bottoming Gun Tap" could be used on screw machines putting whole operation on production basis for first time . . . (2) Now tap, tested on similar operations in plants of business machine and optical instrument manufacturers, gave same gratifying results. "Greenfield" could SHOW HOW problem had been solved before . . . (3) A new and valuable tool was added to "Greenfield's" line.

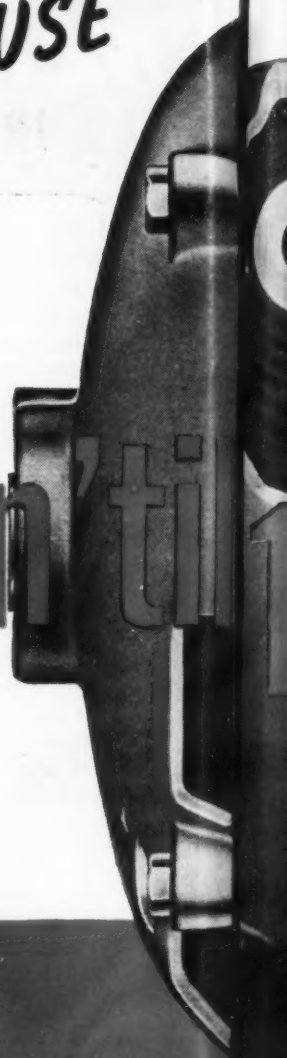
"Greenfield's" SHOW-HOW is KNOW-HOW in action!

ON THREADING PROBLEMS, CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD • MASSACHUSETTS

ANOTHER WESTINGHOUSE MOTOR "FIRST"

"No Lubrication" ti



PRELUBRICATED BALL BEARINGS PRACTICALLY ELIMINATE BEARING MAINTENANCE...NOW STANDARD ON TYPE CSP MOTORS UP TO 3 HP

Twenty-two years ago Westinghouse was "first" with the "Sealed-Sleeve" Bearing that eliminated oil leakage, kept out dirt, and reduced maintenance on sleeve bearing motors. Today Westinghouse offers the first self-sealed, prelubricated ball bearing that eliminates lubrication for five years. Type CSP prelubricated motors bought now will need no lubrication until 1950.

Prelubricated bearings in Westinghouse motors have been thoroughly field-tested in thousands of Westinghouse lint-free textile motors. Recently a series of bearings was chosen at random and inspected from a group of 600 motors, the first of which were installed between six and seven years ago. All were in perfect condition—even though they had been in operation 24 hours a day and had never been lubricated.

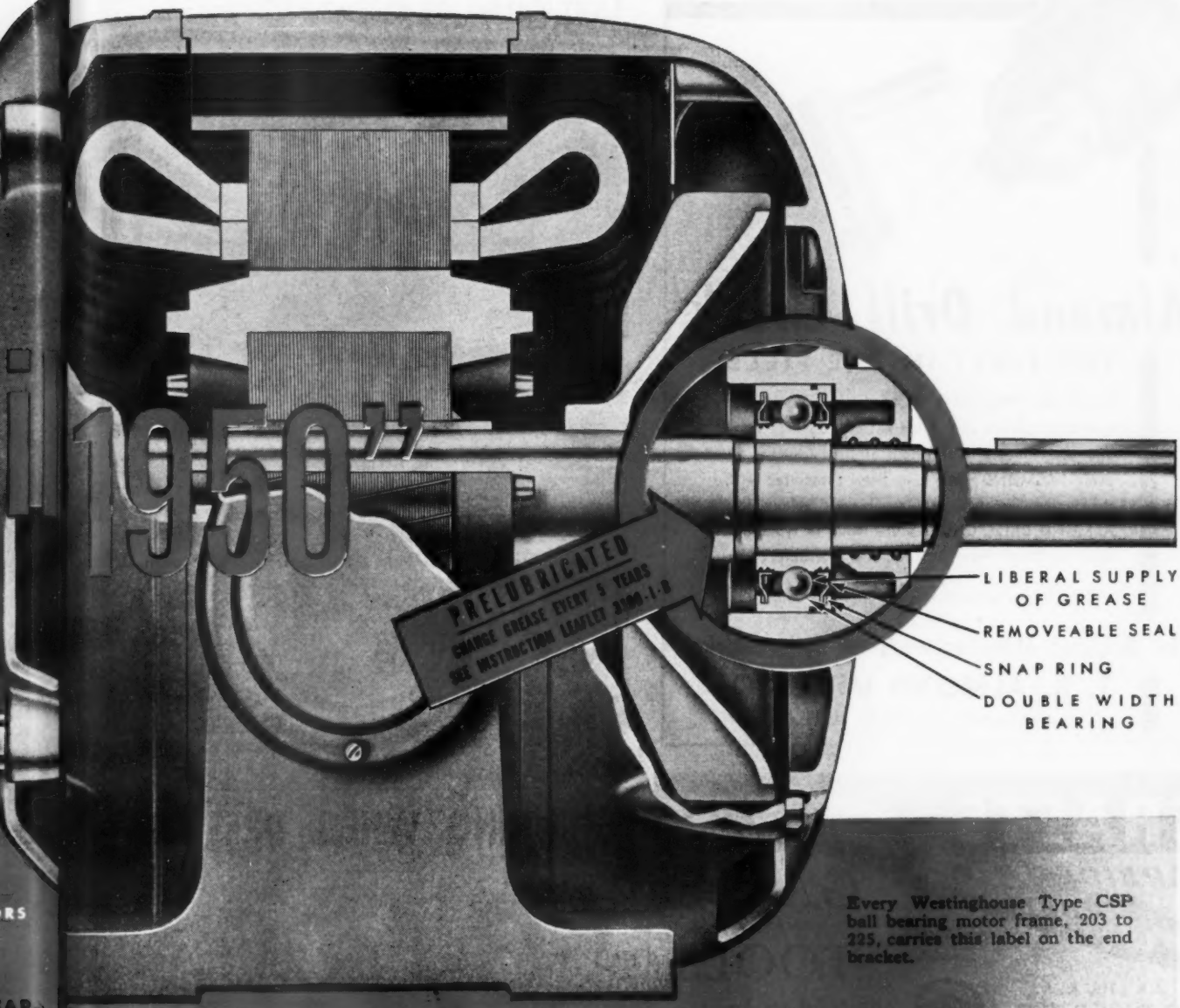
Time-tested special applications such as these have often paved the way for improvements in standard motors. Type CSP motors incorporate the fruits of wide Westinghouse motor application experience. When you buy a Westinghouse Type CSP motor, you get all the latest improvements. For complete information, write for DB 3100-CSP, Westinghouse Electric & Mfg. Co., P.O. Box 868, Pittsburgh 30, Pennsylvania. J-21318

ADVANTAGES

OF WESTINGHOUSE TYPE CSP MOTORS

- PRELUBRICATED SEALED BALL BEARINGS reduce lubrication maintenance ... assure longer grease life.
- IMPROVED TUFFERNELL INSULATION.
- DYNAMICALLY-BALANCED ROTOR.
- DIE-CAST ROTOR with oversize fan.
- LIBERAL THROUGH-VENTILATION—air enters front, leaves at drive-end of motor.

WESTINGHOUSE

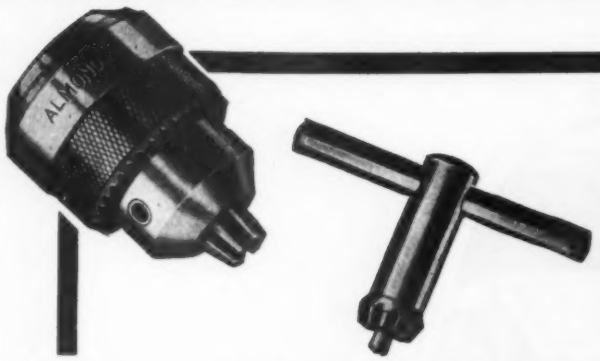


Every Westinghouse Type CSP ball bearing motor frame, 203 to 225, carries this label on the end bracket.

Westinghouse

PRELUBRICATED SEALED BEARING CONSTRUCTION . . . retains original grease packing within the stationary seal discs. Bearing chamber accommodates grease sufficient for more than five years of severe service. Held by snap rings, seal discs fit closely over inner race, forming an efficient seal. Snap rings and discs are easily removed to permit packing new grease in bearings.

TYPE CSP MOTORS



Almond Drill Chuck

THE FIRST IN THE FIELD

ALMOND THREE-JAW DRILL CHUCKS were the first to be placed on the market over Seventy years ago. As Pioneers in the field of Drill Chucks, the name "ALMOND" has long been associated with the logical procedure of machine developments. ALMOND DRILL CHUCKS are made in types and sizes to fit all machine tools and portable drills.

Complete information is available on request.

The Original Manufacturers of Drill Chucks

T. R. ALMOND MFG. CO.
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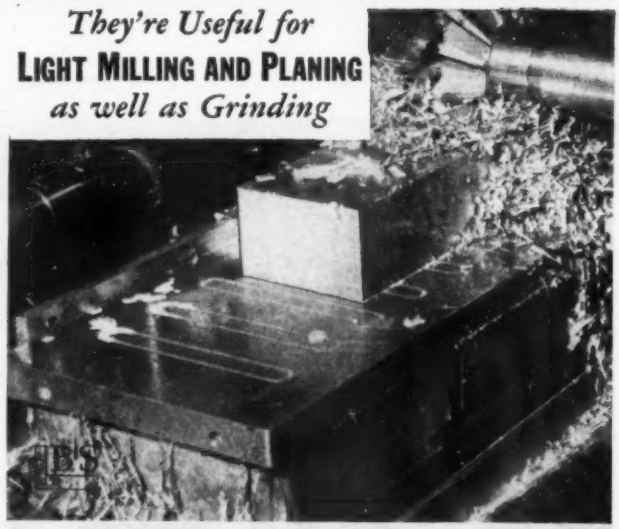
They're Useful for
LIGHT MILLING AND PLANING
as well as Grinding



Simply place a Brown & Sharpe Permanent Magnet Chuck on a machine and go to work—wires, switches, generators are not required. These chucks simplify difficult holding jobs for many light milling, planing and shaping cuts as well as for grinding operations.

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2½"x5"
5"x10" 8"x24"
6"x18" 12"x36"
ROTARY MODEL
9" DIAM.

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Consistent Quality

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The performance of SuperKool in accomplishing impossible draws has made friends for it in plants producing all types of metal products from kitchenware to bombs. SuperKool spreads smoothly, adheres well, and holds up under highest pressures. Stuart Oil Engineers are qualified by long experience to help you with your metal working problems. D. A. Stuart Oil Company, Limited, 2729 So. Troy Street, Chicago 23, Illinois.

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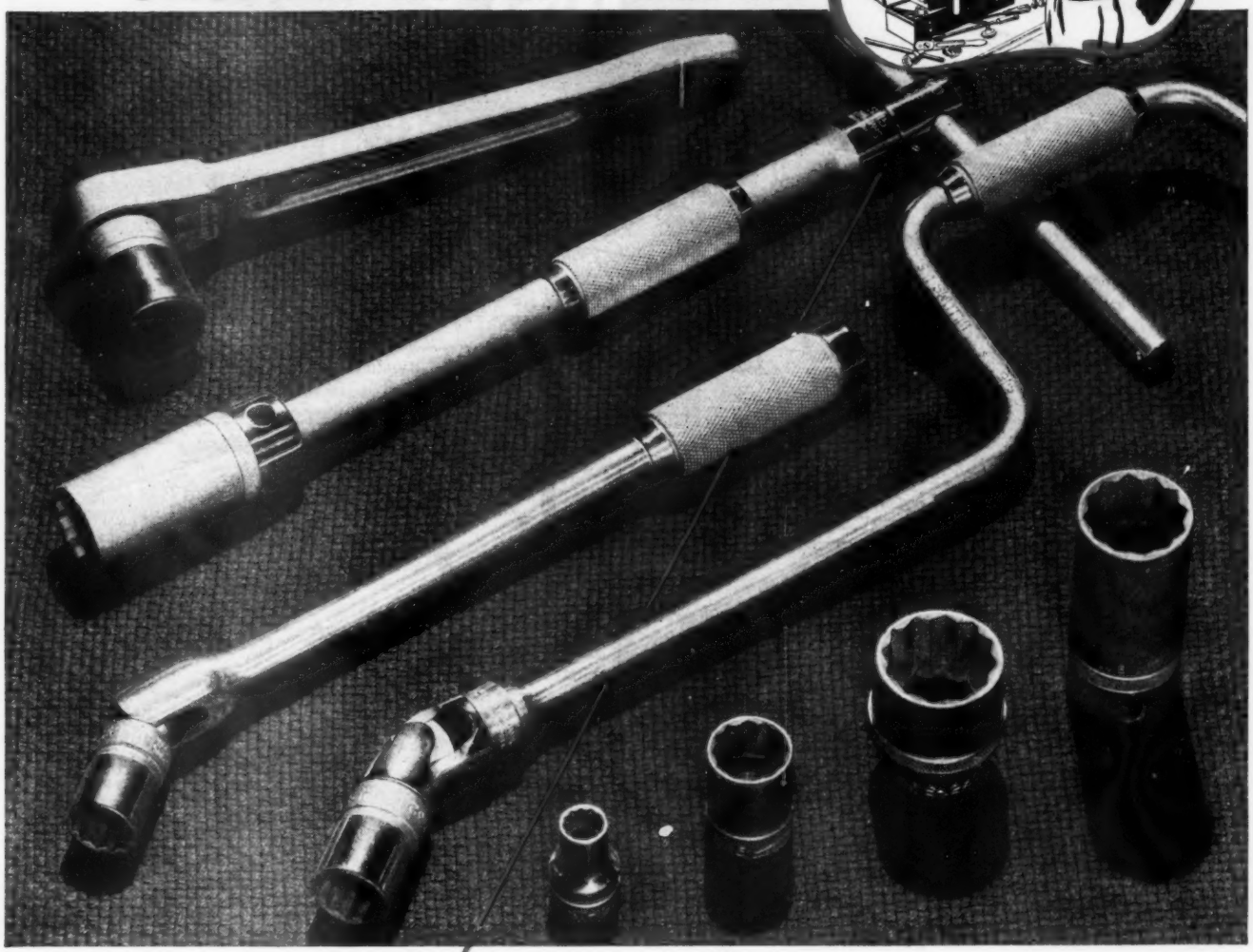
ESTABLISHED 1865

Multiplying
SKILLED HAND POWER



Williams' "Supersockets" actually are more than wrenches; they are an extremely flexible *system* for multiplying the skill and productivity of human hands. "Supersockets", with their almost endless combinations of handles, parts and different socket types, enable the operator to assemble a *special tool* to fit exactly the particular job at hand.

Five different patterns, with drives ranging for 1/4" to 1" square, cover every conceivable industrial application. They provide the utmost in speed, safety and power. These rugged, time-saving tools are sold by Industrial Distributors everywhere. Descriptive literature will be mailed on request. J. H. Williams & Co., Buffalo 7, N. Y.

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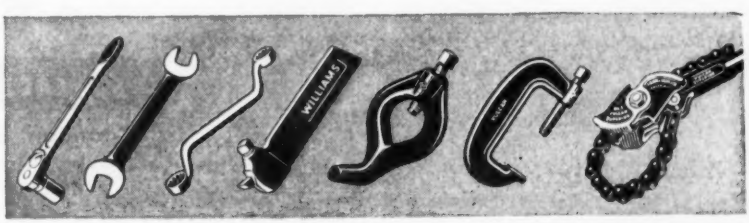

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Abrasive Belt GRINDERS-POLISHERS

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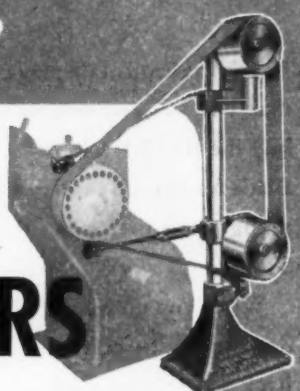
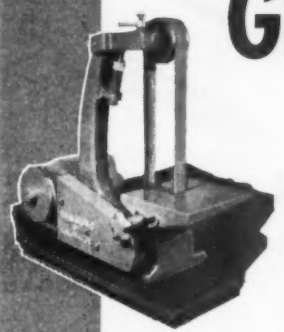
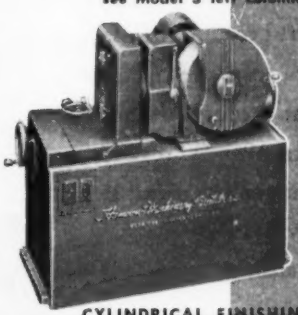


BACKSTAND No. 4 (shown) see Model 3 left column



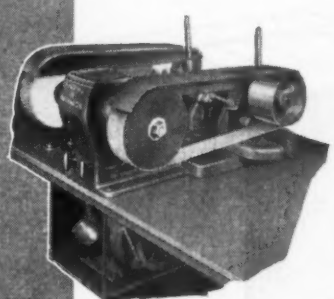
Flexible Belt Unit, 2" type F-2

Here Hammond offers you the machines for doing a better grinding and finishing job with abrasive coated belts. They are built to the highest standard of machine tool construction and provide low cost, high production unit for the particular job to be done. Whatever your problem . . . investigate the available Hammond machine for handling it.



CYLINDRICAL FINISHING UNIT — Model OD-9 shown

FLEXIBLE BELT UNIT — Inexpensive bench or pedestal type for replacing the slow, more costly grinding and finishing methods now being employed throughout your plant.



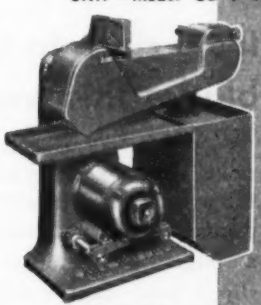
GRINDER-POLISHER COMBINATION — Use either belts or wheels or both, 3" belts

GRINDER-POLISHER COMBINATION — Uses belts or wheels or both on same machine, whichever set up is required to do the job. Availible in bench and floor types.

BACKSTAND-POLISHING LATHE UNITS — handles heavy duty finishing jobs faster . . . better.

BACKSTANDS — Either bench or floor types for converting your present Polishing equipment into belt finishing units.

CYLINDRICAL FINISHING UNITS — for ¼" to 9" outside diameter tubes, rods, bars.

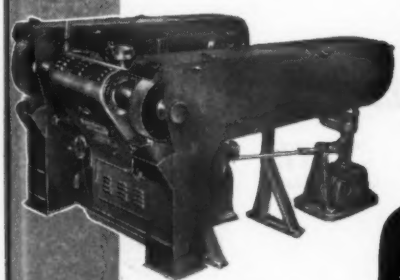


WET-N-DRI — Vertical and Horizontal 6" Grinders

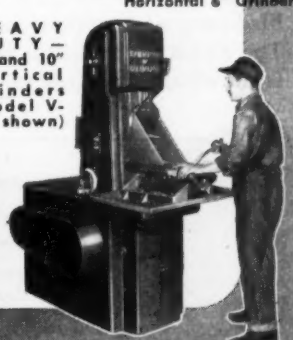
WET-N-DRI 4" and 6" Horizontal-Vertical GRINDERS, either bench or floor type units for high production, low cost finishing.

HEAVY DUTY — 8" and 10" Vertical floor type GRINDERS — Wet-n-Dri operating, handle wide range of small and large parts to be finished.

HEAVY DUTY — 8" and 10" Vertical Grinders (Model V-10 shown)



BACKSTAND No. 3 and Hammond Variable Speed Polishing Lathe Unit



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OTHER HAMMOND PRODUCTS — CARBIDE, GENERAL PURPOSE & ABRASIVE BELT GRINDERS • AUTOMATIC & CYLINDRICAL FINISHERS • POLISHING LATHES

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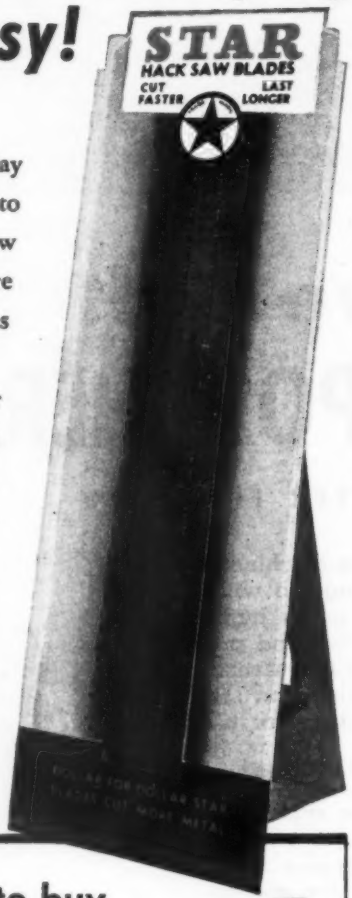
STAR DISPLAY

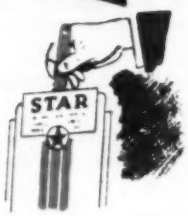
makes blade-buying *quick, easy!*



Here's the kind of display that will *remind* you to buy the BEST Hack Saw Blade for the job you are doing. And that means STAR.

When you go to your dealer to purchase hack saw blades, look for this attractive colorful counter display. You can slip a blade out through the top, examine it, test its temper, its flexibility, its fine workmanship.

It's a cinch to buy blades this way



You don't buy a "pig in a poke" when you select a blade from this open-face STAR display. Blade withdrawal is a "finger-tip" operation. Just slip a blade out through the top of the open box, and satisfy yourself that STAR blades are the blades you want for the type of work you are doing. The STAR Unbreakable Special Flexible Blade is the all-around blade for the expert mechanic.

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Middletown, N. Y.

Please send me a copy of your booklet "Metal Cutting".

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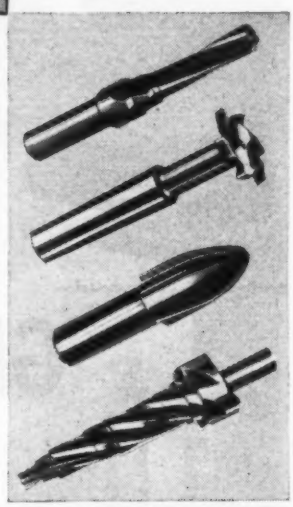
Address_____

Kind of work_____

7070

"KINDA AWKWARD SHAVING? ISN'T IT BILL?"

"YES—BUT THIS A. C. E. CUTTING TOOL IS AS SHARP AS MY RAZOR."



Bill may be a bit optimistic about his reamers, but the plain truth about A.C.E. Special Cutting tools is that their edges are both sharp and long wearing—they do a pile of cutting work before resharpening.

You can obtain A.C.E. Special Cutting tools in all types, both hi-speed and carbide tipped. Specials to blueprints only.

Send inquiries for prompt quotations—early deliveries—Bulletin 301 on request.

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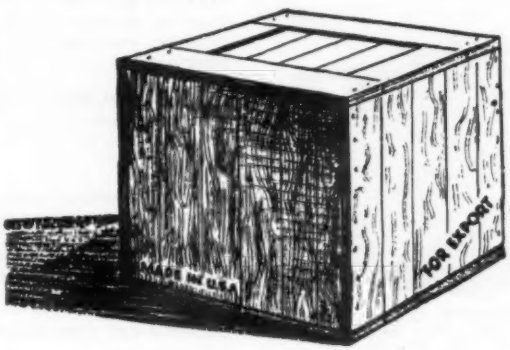

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This background of experience can be most helpful to you in preparing NOW to speed your reconversion to peacetime production. Consult us. Perhaps we can suggest ways to save set-up time, reduce tooling cost and produce more economically.

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Special Tooth Design

. . . that marks the difference between the ordinary "wide-spaced" tooth band saw and the new

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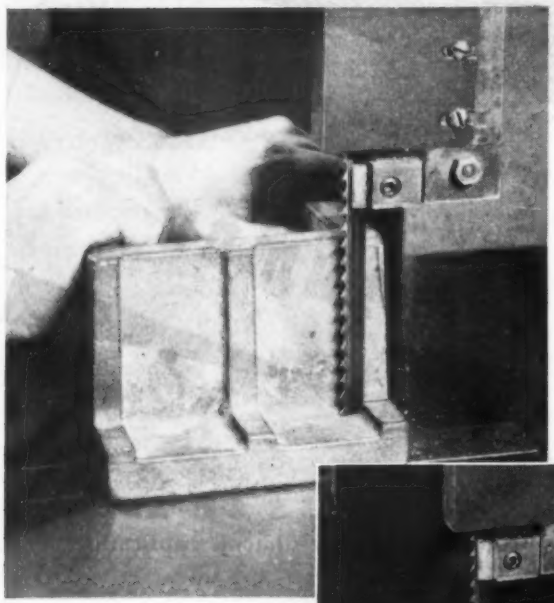
Skip Tooth

BAND SAW



• THERE'S A BARNES BAND SAW FOR EVERY BAND SAW OPERATION

Look for the specially designed shape of the tooth . . . it's there! Thoroughly tested under actual production conditions, this new tooth design is Barnes engineered to facilitate *easier, faster* cutting of magnesium, aluminum, soft brass and other non-ferrous metals . . . plastics, composition, fibre, wood, etc.

Hard edge, flexible back construction . . . designed for high speed cutting . . . fits any band saw machine. Lasts longer . . . more economical, for it can be used until completely worn out . . . no worktime lost in resharpening.

Your Barnes Distributor stocks the Skip Tooth as well as the complete line of Barnes Saws and Hack Saw Blades . . . Call him for full information and prompt delivery on any Barnes product.

ESTABLISHED 1919

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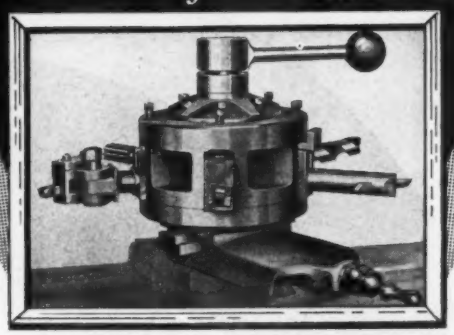
PORTRAIT *of* A TIMESAVER



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THIS, WITH TEN ACCURATE INDEXED TOOL POSITIONS ALLOWS MINUTE ADJUSTMENTS

Time saved brings VICTORY that much nearer. Our NEW IMPROVED TURRET HEADS are built to take heavy cuts, and give precision service. Inexperienced help can quickly become fast operators with these NEW IMPROVED TURRET HEADS.

MADE UP IN FOUR INDIVIDUAL SIZES

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232 CHARLES STREET, AUBURNDALE, MASS.

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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 298 Nov. 23, '44, American Machinist

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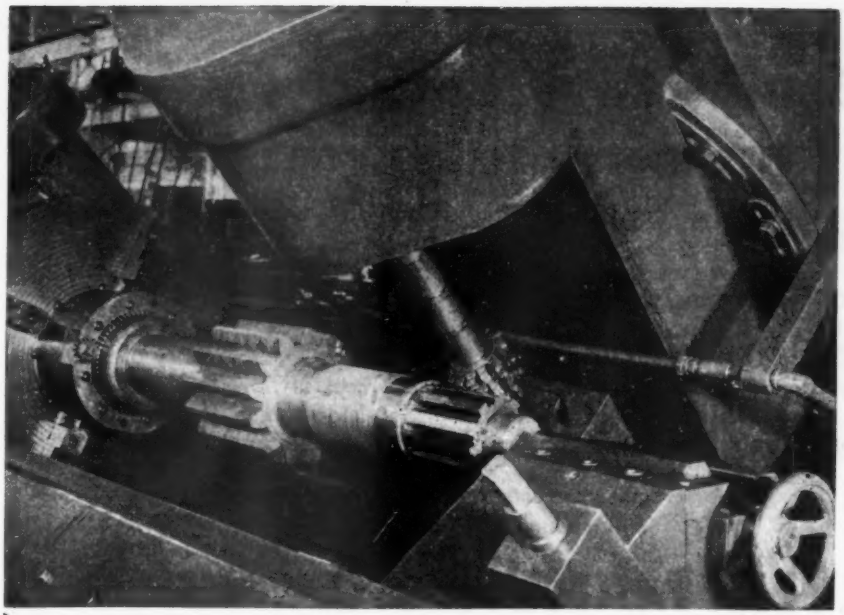

High-Speed Hob Cutting Splines at Lima Locomotive Works

From Blueprint to Product

An important operation in Lima Locomotive Works, Incorporated, Lima, Ohio, is the cutting of splines. The picture shows a vertical swing shaft with the National Tool hob cutting splines on a Simplex Hobbing Machine.

The spline section is 5" O.D., 10 splines, .780" width of spline, the spline section being 5" long. The material is S.A.E. 4140 steel with a brinell hardness of 225-265. The spline is finished complete in one cut, hob operating at 45 R.P.M. with feed of .009 per revolution.

NATIONAL TOOL PRODUCTS

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SLITTING SAWS • COUNTERBORES
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HOBS, GROUND AND UNGROUND
SPECIAL TOOLS

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NATIONAL TOOL Co.

11200 MADISON AVENUE CLEVELAND, OHIO

C-F POSITIONERS

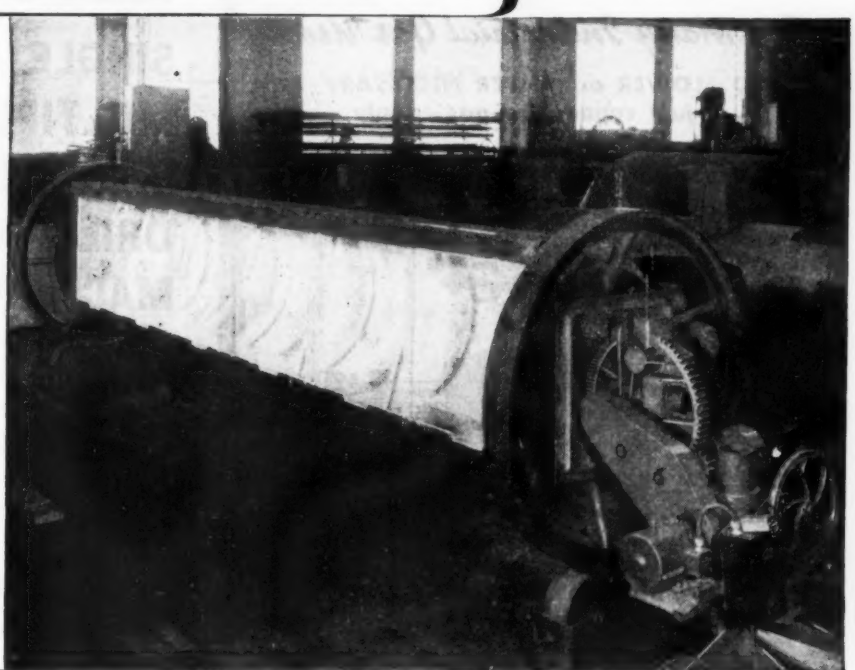
Save 72 Lifts

The Nordberg Manufacturing Co., Milwaukee, have eliminated 72 lifts per unit by using a C-F Positioner on the production job illustrated. These complex weldments (Scavenging air headers for large Diesel engines) have to be "procedure-welded" and formerly required 72 crane lifts which took an average of 20 minutes apiece.

Now, the C-F Positioner moves the weldment through the routine positions under a push button control saving 24 hours crane time, 24 hours crane operator's time, and the same of both a sling man and the welder's time per weldment . . . in other words saving three man-days and one crane-day on each header produced.

C-F Positioners come in 6 sizes—capacities to 30,000 lb. All are pedestal mounted, rotate 360° and tilt to 135° beyond horizontal.

Write for Bulletin WP-22



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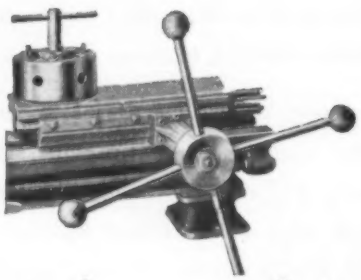
LYNN

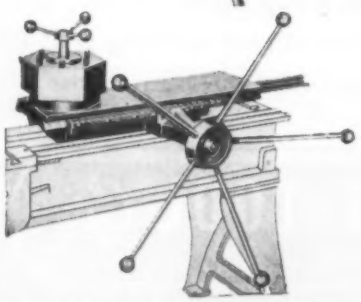
Equip Your Lathes for Immediate Turret Work

Put your idle or unproductive lathes into ***full-capacity*** production AT ONCE—without tedious and costly overhauling.

CONVERT your engine lathes for turret work—or RE-CONDITION your worn or inaccurate turret lathes and screw machines, with LYNN equipment. Easily, quickly mounted on your present lathes, LYNN units give them the speed, range and capacity of ***new turret lathes*** at a small fraction of the cost of new lathes.

We manufacture a complete line of Self-Indexing Bed Turrets, Tool Post Turrets, and other equipment for every make and size of lathe.

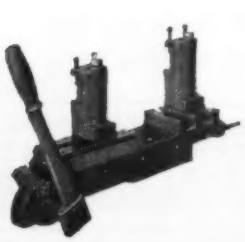


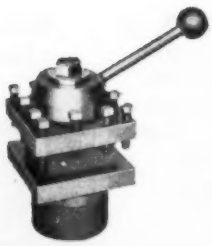


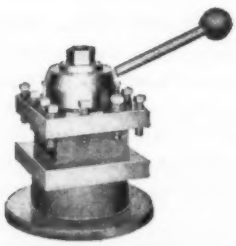
Prompt shipments . . . Write today for full information . . . or ask your jobber

LYNN MANUFACTURING CO.

224 Elroy Street **Minneapolis 8, Minn.**







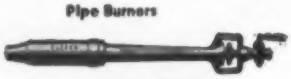
BUZZER Gas BURNERS

Reg U.S. Pat. Off.

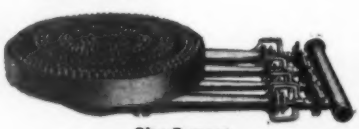
For Many Industrial Gas Uses

NO BLOWER or POWER NECESSARY
. . . just connect to gas supply

Pipe Burners



Nozzle Burners



Ring Burners

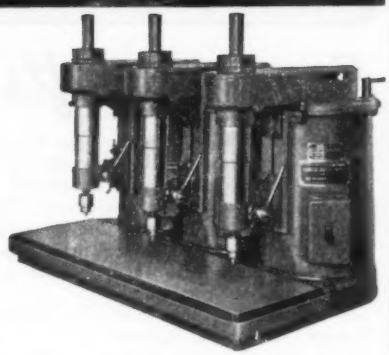
Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

Send for the "BUZZER" Catalog showing complete line of Industrial Gas Burners, Furnaces and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

SIGOURNEY M-100

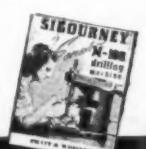
SINGLE OR MULTIPLE SPINDLE DRILLING MACHINES



● Available in 1, 2, 3 and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m. . . . sealed ball bearings throughout . . . all moving parts except chuck and drill completely enclosed for maximum operating safety.

Send for illustrated bulletin.

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.



Sole Sales Agents

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Division Niles-Bement-Pond Co. West Hartford, Connecticut

PAGE *Welding* ELECTRODES

AND NOW... A *New* STAINLESS STEEL ELECTRODE

FOR AC OR DC

• We have withheld announcement of this new PAGE-*Allegheny* electrode until we put it to every possible test—both in our own laboratories and under actual working conditions with Stainless Steel fabricators.

Now we know it's *right.* It's up to the PAGE high standard of quality. This electrode will operate in all positions—will produce smooth beads with very low spatter loss and instant arc action with all types of AC or DC equipment.

Although specializing in Stainless Steel, PAGE offers a complete line of welding electrodes. Whatever your needs, it will pay you to . . .

Get in touch with Page!

ACCO Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco

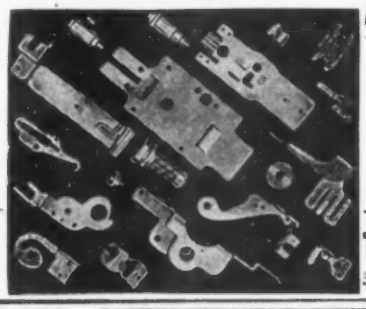
PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE · BRIDGEPORT

ACCO TRADE MARK

CONTRACT WORK

STAMPINGS AND ASSEMBLIES

Fast Service on Long or Short Runs



"GREATER SAVINGS WITH GREIST"

We can handle your stamping and assembly requirements in any metal. Our modern equipment and methods coupled with 50 years of experience is your guarantee of accuracy and efficiency. Our facilities include capacity for handling screw machine products, tools, dies, jigs and fixtures.

Quality work by skilled mechanics is assured. Send your blueprints or samples today for prompt quotations!

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS
- TURRET
- MILLERS
- SHAPERS
- GRINDERS
- LATHES
- SUPPORTING EQUIPMENT

Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.
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SPECIAL ENGINEERING WORK

ON A CONTRACT BASIS . . .
exactly to your specifications . . .

A complete and efficient service for the manufacture of machines and parts, special tools and fixtures, etc., is available to you in our modern, fully-equipped shop. We also offer cam milling facilities that will fit your requirements. You are guaranteed quality work at a reasonable cost.

Send your blueprints or samples today for prompt quotations at no obligation.

Designers and builders of wire and ribbon stock forming machines.

THE A. H. NILSON MACHINE CO., Bridgeport, Conn.

METAL STAMPINGS

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PERMANENT MAGNETS

HEAT TREATING

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1103 E. 23rd St. INDIANAPOLIS, IND.

SERVICE THAT EQUALS YOUR OWN HIGH STANDARDS!

Our shop facilities are designed to carry out those exacting orders for light stampings, jigs & fixtures and general machine work.

Send prints for quotations & delivery
NEW PRODUCTS SOLICITED

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89 ALLEN ST., ROCHESTER 6, N. Y.
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HAMMERED FORGINGS

Gear Blanks, die blocks, crankshafts, forged weldless rings, spindles, forgings of any shape or size.

Forgings machined and/or heat-treated. Immediate deliveries.

BISON FORGE COMPANY
115 MANITOBA STREET
BUFFALO 6, N. Y.

• TOOL DESIGNING AND BUILDING • MACHINES DESIGNED • IDEAS DEVELOPED • PROMPT—EFFICIENT—SERVICE • • REASONABLE CHARGES •

OLD COLONY ENGINEERING CO.
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P.O. Box 672 • Tel. Blackstone 2610
Write — Phone or Telegraph

MACHINE SHOP WANTS DEFENSE WORK

Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

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PATTERNS in WOOD and METAL

For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

WIRE AND METAL SPECIALISTS
in round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

AVAILABLE SCREW CAPACITY

¼ to 4½ Automatic and Hand Screws

Including Necessary Secondary Operation
Forward Samples and Blueprints for Quotations

BRIDGEWATER SCREW PRODUCTS CO., Bridgewater, Mass.

PRECISION FORM GRINDING

Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N.J.
(Makers of J.&S. Radii & Engle Dressing Tools)

SEARCHLIGHT SECTION

POSITIONS VACANT

MECHANICAL ENGINEER—Old established company now converted to pre-war production (Essential Products) has opening for mechanical engineer with some machine design factory layout and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of application. Address P-956, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL AND diemaker—experienced on automatic 4-slide machines. Permanent peacetime job. Good opportunities. Give full particulars. P-153, American Machinist, 330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

TOOL ROOM Foreman: Now successfully employed. Must have proven ability. This position offers excellent opportunity for advancement to the man having the above qualifications. Plant located in Northern Ohio. State former positions held, length of time of each, full background of experience. All replies will be held in strict confidence. Nationally known long established company. Salary. P-181, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DRAFTSMAN EXPERIENCED with drawing dies, tool and jig layout, post-war positions, excellent conditions. P-164, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS VACANT

TOOL AND diemakers experienced with drawing dies for post-war position, excellent conditions; give full particulars. P-163, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER: Graduate engineer experienced in designing metal working machinery. To work with long established Connecticut concern. P-196, American Machinist, 330 W. 42nd St., New York 18, N. Y.

(Continued on page 330)

Opportunity of a Lifetime for DESIGNING ENGINEER

The bag division of the Savannah plant of Union Bag & Paper Corporation desires immediate services of Designing Engineer. Prefer engineer with experience in the manufacture of paper bags, but every consideration will be given applicants with mechanical design experience. Position is permanent, and salary is commensurate with ability. In applying please give full particulars as to experience, education, draft status, salary expected and other pertinent data. Applicants must conform to regulations of War Manpower Commission. Address all communications to Manager, Industrial-Relations Division.

UNION BAG & PAPER CORPORATION
SAVANNAH, GEORGIA

TOOL OR DIE DESIGNERS

Ohio Manufacturer with Die-Cast Division, needs Tool or Die Designers to design Die-Cast Dies, Tools, Jigs, and Fixtures. Broad experience with Machine Tools essential. Some mechanical and hydraulic engineering experience advantageous. Living conditions good in small town, or near-by medium sized city. Excellent post-war opportunities. W.M.C. Rules apply.

P-997, AMERICAN MACHINIST
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

WANTED ENGINEERS MACHINE DEVELOPMENT

Graduate engineer or equivalent, experienced in the design and development of special and experimental machines. Men with creative ability required, experienced in such lines as automatic, semi-automatic, or ordnance equipment. Must be thoroughly acquainted with modern methods and shop practices and capable of developing new ideas in conjunction with modern mechanical laboratory facilities.

State age, marital status, details of education, experience, draft status, present salary and salary expected. Enclose recent photograph or snapshot.

Post-war opportunity.

Applicants must be able to obtain Statement of Availability.

E. I. du Pont de Nemours & Company, Inc.
Personnel Division
Wilmington 98, Delaware

WANTED MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions in New England.

Only men 35-55 with a record of successful achievements will be considered In replying furnish information preliminary to a conveniently arranged interview.

P-140, AMERICAN MACHINIST
330 West 42 St., New York 18, N. Y.

A PLACE WITH A FUTURE AS

TOOL ROOM SUPERINTENDENT

For Manufacturer in Newark Area

To supervise large modern toolroom; should have mechanical engineering background and a minimum of ten years diversified practical experience in the manufacture of small precision dies and tools. Work will include planning and personnel administration. Applicant must have had contact with various phases of mass production manufacture of metal articles.

Excellent opportunity for post war future. We are a long established company and have no reconversion problems.

Box 714
REALSERVICE ADVG. AGENCY
110 West 34th St., N. Y. 1, N. Y.

WANTED MECHANICAL ENGINEER

In light metal stamping and screw machine work.

ALSO

EXPERIENCED DRAFTSMAN

Good opportunity in old established company. Give full particulars as to experience and salary desired.

P-190, American Machinist
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

WANTED MECHANICAL ENGINEER

For Phila. Concern with following duities:

1. Assume charge of small drafting room.
2. Supervise and assisting preparation of shop detail drawings of heavy machinery and special gear reduction units.
3. Extend engineering assistance to shop when required.

Position now held by one man continuously for 28 years retiring on account of age. Definitely a post-war opportunity.

P-170, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITION AVAILABLE *ENGINEER OR TOOL DESIGNER*

Experienced in tool design, and production processes and equipment. Permanent. Applicant must have good practical or technical background. State details of education and experience, draft status, age and availability. Send photo with application and state salary expected. Address your reply to:

A. B. CHANCE COMPANY
210 N. Allen St. Centralia, Missouri

WANTED TOOL ROOM FOREMAN

A well established company in the metropolitan area desires the services of a man to take complete charge of tool room normally employing 15 men. Must have practical knowledge of building tools, dies and special equipment on small and medium precision parts as well as making quick repairs on production tools. We are engaged 100% in war work but this is a real opportunity for a man interested in making a permanent connection. Give age, education, experience, references and salary required in reply.

P-193, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED METAL SPECIALIST

Situation Open — Thorough knowledge metals, broad experience in metal manufacturing and finishing processes. Sales-minded to assist sales and service organization on problems arising in field. Our products extremely essential in all kinds of production, processing and maintenance work. Location N.Y.C. Willing to travel. Give details, experience, age, etc.

P-168, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

SEARCHLIGHT SECTION

PERMANENT POSITIONS

Skilled Mechanical Draftsmen—capable of making and checking detailed product drawings for manufacturing. Supervisory experience desirable but not essential. Creative and designing ability valuable.

Mechanical Engineers — technically trained having experience with manufacturing specifications, methods, quality control and material handling.

If you qualify for these positions, are interested in doing war work now, and in security in the post-war period, write

STANLEY TOOLS

111 Elm St. New Britain, Conn.

POSITION VACANT

Exceptional opportunity for right man. Large machine tool distributor in Chicago District needs experienced machine tool correspondent. Write giving full particulars, experience, age, etc.

P-173, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Illinois

POSITIONS VACANT

(Continued from page 328)

SHOP SUPERINTENDENT—Thoroughly experienced in metal working plant—capable of directing force of 400 employees; familiar with turret lathes—screw machines horizontal and vertical boring mills. Knowledge of gears and transmission assembly essential. Excellent opportunity post-war position. P-195, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GENERAL FOREMAN Wanted. Machine tool company, a leader in its field and located in large industrial metropolitan center, seeks a man experienced and skilled in the building of machine tools; he should be a shop man with a number of years of experience in machine tool construction; state qualifications, experience, companies worked for, for whom now working, etc.; all replies will be held strictly confidential. Secure future and good income assured to the man who can qualify to run the machine tool building operations of this company. P-182, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

DESIGN DRAFTSMAN: Familiar with tool layouts and design. Capable of doing necessary calculations applicable to design of hand tools and metal working machinery. P-200, American Machinist, 330 W. 42nd St., Ned York 18, N. Y.

INDUSTRIAL ENGINEER wants connection progressive concern. Twenty years experience metal fabrication industry. Competent in tool design, production, plant layout long or short time arrangement. Available soon. Address P.O. Box 4713, Station E, Kansas City, Mo.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

WORKS MANAGER plant or factory manager. American, 49 years. Wide and varied experience in air craft, automotive, machine tools, machine and die making, general jobbing. Held positions as plant and factory manager, general superintendent; master mechanic, tool superintendent, strong and rapid increase in production. Practical tool and diemaker, technical education. Thoroughly versed on handling organized labor, grievances and negotiated contracts. Last two positions have tripled gross output. Am now employed. Right connection more desirable than salary. PW-186, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TO ABLE, AMBITIOUS MEN

In Engineering, Manufacturing, Sales & Administration, we offer, AT NO CHARGE, a confidential, dignified opportunity of bringing their qualifications before interested employers. Inquiries from management for key men are invited on a retainer or fee basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

WANTED

SALES ENGINEER

with

EXPERIENCE IN MACHINE TOOLS

capable to contact customers and to handle all related correspondence. Steady employment. New York City.

Write full details, age, experience, and salary expected

SW-194, American Machinist
330 West 42nd Street
NEW YORK 18, N. Y.

POSITIONS WANTED

PRODUCTION MANAGER or plant executive. 18 years experience in production, design, labor relation, sales promotion, engineering and operational phases. Domestic and foreign contacts. Graduate M.E. with excellent experience in metallurgical, chemical and ceramic fields. Position desired where unusual conscientious effort, initiative plenty of responsibility and progress demanded. Permanency and promotional opportunity essential. Salary $10,000 minimum. PW-197, 520 N. Michigan Ave., Chicago 11, Ill.

A PRACTICAL production man available. Would like to make contact with a going concern. On medium heavy work to heavy. With a background as a machinist and toolmaker. With 6 years foreman in machine tool shop, and 16 years general foreman in large department on short runs of work. Can layout tools and method of work from blue prints. Can design tools for same layout operations, estimate time, can furnish good reference. What have you to offer. PW-198, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALESMEN WANTED

MACHINE TOOL Salesman. Must have experience in sales and engineering of small and perishable tools, salary and commission. Location eastern territory. SW-188, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: by a leading industrial organization, sales engineers who have had technical training or sales experience in product application in such lines as cutting tools, grinding wheels, welding equipment and power transmission. A fine opportunity for advancement in both income and responsibility. SW-199, American Machinist, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITIES

PATENT FOR Sale Car Heater—the most simple, efficient, and inexpensive to manufacture. Further details write V. Turdin Hope Hill Road, Wallingford, Conn.

MANUFACTURERS' AGENT with over 25 years experience is desirous of procuring a patented device, small, compact, and outstanding in novel. Preferably, the device should be for large industries and should be easy to manufacture and made of brass, bronze, or aluminum. Address replies to BO-201, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

SALES ENGINEER WANTED

Well established machine tool distributor with exclusive contracts handling the finest quality and best nationally known machine tool builders needs high-class sales engineer to contact purchasing and engineering departments of large New York corporations in metropolitan area. Above the average salary, expenses and incentive arrangement. Above draft age preferred. Must have pleasing personality and some knowledge of machine tools and engineering. Must have selling experience although previous machine tool selling experience not necessary. Write complete details of past business experience.

SW-192, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

SALES ENGINEERS WANT LINES FOR PACIFIC COAST!

Now is the time to get "set" in the rapidly expanding industrial Pacific Coast! We are thoroughly qualified to give manufacturers in electro-mechanical field a low-cost, full sales-coverage of this important market. For details

Write or Wire

Sales Engineering Associates,
INCORPORATED
3907 San Fernando Road
GLENDALE 4, CALIFORNIA

SALES OFFICE AND PERSONNEL AVAILABLE

Desires connection with well established company whose product must be handled by technically trained men. Office located in industrial center of Michigan. Will cover all middle west states if necessary.

SA-179, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Illinois

WANTED TO BUY

Principals, long established and experienced in machine shop business are interested in buying for cash any established manufacturing business.

We prefer such opportunities where, after sale, personnel will remain and where the present owner will continue to supervise production at an attractive salary. We would furnish overall management, supply orders, new equipment, capital etc.

Send brief description of Product and activity with first letter.

Area within 30 miles of Newark, N. J., preferred.

BO-176, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE

Prosperous corporation manufacturing machine shop accessories. Purchasers may take over management if desired. Present management will stay if a few stock holders who want to sell are bought out. Present management has new "sure-fire" products and real distributor contacts. A successful company for 86 years doing business through mill supply and hardware trade. 40,000 square feet, 16 acres land abutting rail lines. Foundry, machine shop, administration building, etc. Equipment in good condition. Reply to

BO-146, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE

Complete rights and title on a quick change punch for sheet metal dies. A good war or post war opportunity, copies of patent will be furnished.

Graham Products Engineering Co.
Lansing 6, Michigan

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

• • • OUR INVESTMENT IS YOUR SECURITY
• • • SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK*

SHEARS

Lennox Splitting Shear, 8' throat, 3/4" cap., arr. M.
Lennox Bevel Shear, 3/4" cap., arr. M.D.
Dreis & Krump Apron Brake, 10' x 10 ga., #204, motor driven.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4 1/2 Bliss D.C. B.G. Forging 4" stroke (2).
#4 1/2 Bliss 3 column B.G. 3" stroke.
#5 Bliss D.C. B.G. Forging 3" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Vertical, 48" Gisholt.
Hill 4" Bar Horizontal Table Type.
Horiz. #36 Landis-Rochester, 3 1/2 Bar Floor Type—Floor Plate 72" x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
54" Colburn Vertical Boring Mill.
No. 31 Lucas Horizontal Boring Mills 3".

DRILLING MACHINES

Cincinnati-Bickford 24", 4 spindle, #4 M.T. Table 20" x 67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Leland Gifford 2 spindle.
Woodward & Rogers 6 spindle.

RADIAL DRILLS

3' Dreses, 9" Rd. Column.
3' Arm 9" Col. Cincinnati Bickford
4' Arm 11" Col. Cincinnati Bickford
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford

MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed
Natco #D-5, 10 spindles #1 M.T.

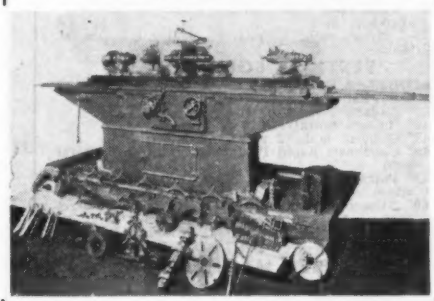
SLOTTERS

Betts 36" Geared Slotter, Motor driven, 54" dia. Rotary table.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
12" Heald Rotary Surface Grinder equip. with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump.
Oliver Model 51 Drill Grinder; 1 1/2" cap.
Pratt & Whitney 14x36 model B vertical surface grinder.
#2 Brown & Sharpe Surface Grinder.

Brown & Sharpe No. 4 Univ. Cylindrical Grinder. M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10 3/4". Distance between centers 60". Takes wheels to 12" dia.x1/2" to 1" thick. Longitudinal Table travel — 10 changes in rate; range 1 1/2" to 53" per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

#4 & #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1 1/2 Brown & Sharpe, Plain (2).
#1 Kempsmith Universal, Cone Drive.
No. 1 1/2 Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
Ames Precision Universal Bench Mill.
P & W 2 1/2" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller.
No. 1B Hendey Universal, cone drive.

ATTENTION

75 KVA Thompson Gibbs Welder. Purchased new in 1942. Complete with timer and tube. 60 cycle, 440 volt operation. Immediate delivery.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" N.-B.-P., Planer Shaper, M.D

LATHES

Putnam 26 x 12 Heavy QCG, arr. for M.D
American, 16 x 6 Q.C.G., Geared Head
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3 1/2" dia. hole in spindle (2).
LeBlond 14 x 6 Q.C.G.
Seneca Falls Tool Room 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper Att. (2).

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers (2).
12" Schuchart & Schutte Gear Hobber
#1 Adams Gear Hobbers, Belt driven (3).

BENDING ROLLS

Bertsch 3" x 3" x 3/8" angle bending roll
Niagara pinch type 7' x 7" roll motor driven.

MISCELLANEOUS

J. C. Miller Co. Lacq. Heater with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face, 20" diameter.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. 3/4" to 1 1/2". New this year.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

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AUTOMATICS

No. 0 Brown & Sharpe
1¾" Gridley 4-spindle
4½" Gridley 4-spindle chucking, Model H
No. 434 New Britain, 4-spindle chucking
7" Baird 6-spindle chucking
14"x19" Fay automatic lathe
⅞" and 2" Cleveland "B"

COMPRESSORS

92' 7"x6" Ingersoll Rand
427' Chicago tandem steam driven
550' National 3-cylinder vertical with motor
1400' Sullivan 2-stage with motor

DRILLS

Sensitive, all makes and types
20", 21" & 24" Cincinnati upright
23" Weigel, BG, PF, tapping att.
3½' American radial
4' Western radial, Timken bearing, MD.

GEAR CUTTERS

Nos. 7 & 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x6" G & S spur gear cutter
11" Gleason straight bevel, segments & gears
13" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear chamferers
Lipe 2-spindle gear chamferer

GRINDERS

No. 1 G Gronby internal
No. 75 Heald internal
Heald No. 72 automatic electric sizing internal
12"x36", 16"x36" and 16"x52" Landis
10"x36" Norton
8"x24" No. 1 Brown & Sharpe universal
6"x20" No. 10 Brown & Sharpe
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x48" Landis crankpin grinder
No. 60 Heald & No. 6 Landis cylinder grinders

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
400# Chambersburg board drop hammer
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x8' Sebastian
16"x8' Porter McLeod
18"x8' Sidney
20"x9' Whitcomb Blaisdell
28", No. 3B Foster turret
22" & 26" Libby turret
8" & 12" Sundstrand Stub
15" Sundstrand automatic Stub

MILLERS & BORING MILLS

2½" Universal horizontal mill
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
Nos. 2 & 3 Kempsmith plain
Nos. ½ & 2 Van Norman plain
No. 12 Brown & Sharpe Mfg. elec. drive
No. 3 Sundstrand bed type mfg miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 3 Lees Bradner thread
4" Rice Barton double spline

MISCELLANEOUS

No. 6 Waterbury Farrel openback press
6" Bignall-Keeler pipe threader
2" Landis pipe machine
3" Acme belt threader, Landis head
6"x6" Hilles-Jones angle shear & Turn table
No. 7 Greenard arbor press, practically new
Arcade jar molding machine
Cleveland sand cutter
4" Stevens die slotter, New 1941

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4 spindle ⅞" Cleveland Model M, m.d.
2¼" Cleveland Model A, m.d.
4 spindle 2¼" Cleveland Model K, m.d.
2¼" Gridley Single, m.d.
2½" Cleveland Model A, m.d.
3¼" Gridley Single Spindle, m.d.
4¼" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
No. 6D Potter & Johnston, m.d.
No. 22 New Britain, m.d., tapping spindle
No. 23 New Britain, tapping spindle
No. 33 New Britain, m.d., tapping spindle

HORIZONTAL BORING MILLS

5" bar Niles Floor Type Horizontal, m.d.
3½" bar Rochester Floor Type Horizontal, m.d.
2¾" bar Sargent Floor Type Horizontal
No. 0 Fosdick Horizontal, table type, 3" bar
No. 21 Lucas, 2½" bar
No. 33 Lucas, 4½" bar, m.d.
3½" Betts, m.d.
4" bar Detrick & Harvey Floor Type, m.d.
4" Niles Table Type, m.d.
4½" Niles, m.d.
5½" Niles, m.d., table type, with extra circular table

VERTICAL BORING MILLS

24" Bullard New Era, m.d.
36" Bullard New Era, m.d.
42" Bullard New Era, m.d.
42" Bullard Spiral Drive, m.d.
42" Colburn, m.d., 2 swivel heads
48" Cincinnati Rapid Production, 1 turret, 1 swivel head
48" Putnam Car Wheel Borer, belt, with facing attach.
60" Niles-Bement-Pond, m.d., 1 swivel, 1 turret head
10' extended to 16' Betts, m.d., 2 swivel heads
12" Niles, m.d., thru gear box, 2 swivel heads

PIPE MACHINES

2" Curtis & Curtis, m.d.
2" Bignall, belt
3" Jarecki, belt
4" Curtis & Curtis, belt
4" Eaton, Cole & Burnham, belt
4" Merrell, belt
6" Columbus, belt
16" Cox, m.d.

PRESSES

No. 4½ Bliss S.S. D.C.
851 Ferracute D.C.
B45 Metalwood Hydro-Pneumatic
B33 Metalwood Hydro-Pneumatic

PUNCHES & SHEARS

Cleveland Type C, m.d., 12" throat
Cleveland Type G, m.d., 12" throat
No. 6 Long & Allstatter, 9" throat

SAWS

12x15" Racine, m.d. thru gear box
13x16" Peerless, m.d. thru gear box
No. 3 and 8 Nutter & Barnes Cold Saws
No. 5 and 6 Cochran-Bly Cold Saws
No. 11½ Higley Cold Saw
No. 138 Espen-Lucas Cold Saw, m.d.
No. 15 Lea-Simplex Cold Saw

TURRET LATHES AND SCREW MACHINES

No. 2 Geared Electric Bardons & Oliver, m.d., in base, latest, bar
No. 2 Morey, m.d. in base, latest, bar
No. 2 Pratt & Whitney Shaver, m.d., 1⅝" cap.
No. 3 Cincinnati Acme Full Universal, m.d., duo-control
1½x18" Pratt & Whitney Turret, cone
2½x24" Jones & Lamson Geared Head Flat Turret, m.d., bar
3x36" Jones & Lamson Geared Head, Flat Turret, m.d., bar
2 spindle Jones & Lamson Geared Head Flat Turret, m.d., chucking
3½" Cincinnati Acme Geared Head Flat Turret, m.d., chucking
3½x32" Jones & Lamson Geared Head Flat Turret, m.d.
14" Fay Automatic, Flanders Type, m.d.
18" Libby Type A Turret, m.d., chucking
20"x9' American Geared Head, m.d.
24" and 28" Gisholt, cone
24" Steinle, m.d.
26" Libby Type C Turret, m.d., 7⅛" hole
Wood Tilted Turret, type D, cone

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2½", Universal; 2½"-4" Binsee
4" Landis Horiz. Floor Type, M.D.

VERTICAL
66", 120" Niles
42" Bullard, M.D., 54" Colburn M.D., 2 hds.

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Nos. 2A, 3A W. & S., 4½" hole, M.D.
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D.
W. & S. No. 4 Univ., M.D.
J. & L. 2¼x24", 3¼x36"
Acme 3¼x36" grd head

GRINDERS
P. & W. 14", 18" B.B. Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12"x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D.
Norton 50"x28', M.D.
Gardner 72" disc, M.D.
Landis 6x20", Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
B. & S. No. 3 Univ.
B. & S. No. 11, S.P.D.
12" Heald Rotary, M.D.

LATHES
McCabe 26-42"x14'
26"x24' Putnam 3 step cone, D.B.G.
24"x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
16"x8' Lodge & Shipley Grd. Hd., taper, M.D.
14"x6' Hendey, taper, collets
9' LeBlond Automatic
36"x30' Putnam, M.D.
36"x20' Putnam S.C.G., D.C. M.D.
36"x30' LeBlond, M.D.; 32"x35' Wickes M.D.
Putnam 42"x16' M.D.
30"x26' L. & S. 12 speed, M.D.

AUTOMATICS
New Britain 1⅝"x7" 6 spindle, Timken Bearings
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B, 1", 2"
Cleveland ⅞', Model M, 4 spindle
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.

PLANERS
72"x56"x16' Gray, 4 heads, M.D.
30"x30"x8' American, 1 head
24"x24"x8' Cincinnati, 2 heads
36"x36"x8' Cincinnati, 3 heads
24"x24"x6', 1 head
32"x32"x10' Pond, 1 head

SHAPERS
16" Rockford Hydraulic M.D.
20", 24", G. & E.
16" Ohio, M.D.
16", 20", 26" Stockbridge

RADIALS
4', 7', 8' American Triple Purpose
5' Dreses Full Universal
3', 3½' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES
Ingersoll Planer type 36"x36"x12', 4 hds. M.D.
No. 20 Van Norman; 10" P. & W. Auto
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5, B. & S. Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4 Cincinnati Vert.
P. & W. No. 12 Profiler, M.D.
No. 4 B. & S. Universal
Rowbottom Cam Miller
K. & T., B. & S. No. 3, Dbl. overarm, Timken Bearings

MISCELLANEOUS
10'x⅜" Geo. Ohl Shear, M.D.
Gorton No. 1S, 3S Engraving Machines
6 spindle Avey Drill, 15' overhang
800 ton coining press; McCabe ½" Flanger
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Pels 6' Throat Punch; Pottstown Tappers
P. & W. 6" Vert. Shaper
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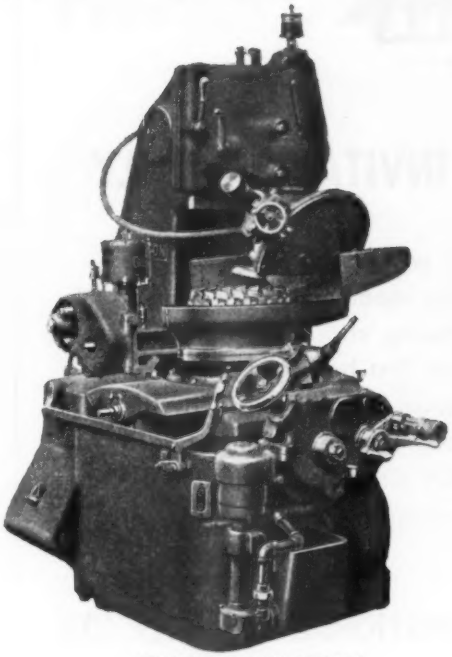

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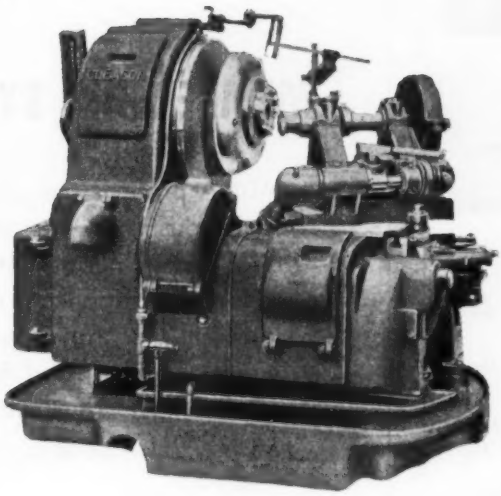

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Motor Drive
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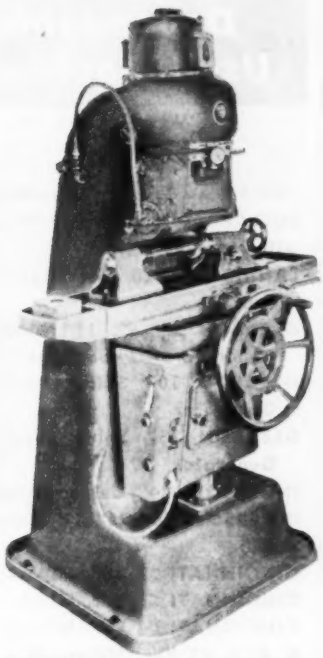

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Worthington, 8 x 10, 100 cubic ft. M.D. 25 HP, AC.

AUTOMATICS

Cleveland 1¼" Model "C" Single Spindle
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Acme #53 four spindle
Acme #55 four spindle
Acme #56 four spindle

BORING MILLS

Bridgeport 36" with two swivel heads
Niles 60" boring mill, two swivel heads
Giddings and Lewis #0 Horizontal Boring Machine 3⅛" spindle
Rogers 42" Boring Mill, two swivel heads
Gisholt 34" Boring Mill, MD

DRILL PRESSES

Allen, six spindle ball-bearing

GRINDERS

Landis Universal 10 x 30
Landis #3 Universal Cylindrical Grinder 12 x 42"
Universal, semi-automatic spline
Osterlein Horizontal Disc Grinder
Gleason 4" Spiral cutter grinder
Gleason 12" spiral bevel cutter sharpener; late type, MD
Brown and Sharpe #11 Plain Universal Grinder
Norton 14" x 72" Plain Cylindrical MD
Heald #70 Internal Grinder, MD with 3 motors
Pratt & Whitney Worm

GEAR CUTTERS

Fellows 24" Gear Shaper
Fellows #4-T Thread Generator
Gleason 8" Spiral Bevel Gear Generator
Barber Coleman #12 Gear Hobbers (3)
National Red Ring Gear Finishing Machine

MILLING MACHINES

K and T #1-A Plain, vertical attachment
Becker #6 vertical
Kearney & Trecker #1½ B Vertical MD

LATHES

Boye-Emmes 32" x 18' Quick Change Lathe, triple back geared
Johnson, geared head, 42" swing x 62' bed quick change
Bridgeford, geared head, 36" swing x 22" bed, quick change, taper attachment

THREAD MILLS

Lees-Bradner, #3

TURRET LATHES

Steinlee 24" Turret Lathe, 6¼" hole thru spindle, geared head, MD (two)
Warner & Swasey #3-A Geared Head, Universal, MD

SPOT WELDERS

Rex, 10 KVA, 20 KVA Foot Operated
Rex, 30 KVA Air Operated
Rex. 75-100-150 KVA
Rex, 35 KVA MD 2 speed
Armglo 10 KVA, 20 KVA Rocker Arm type
Taylor type S-6-2 Spot Welder, 13 KVA
Taylor Type S-6-2 Spot Welder, 13 KVA automatic attachment MD
Taylor Winfield Butt Welder, Type B-8

MISCELLANEOUS

National Red Ring Lapper, MD
Bethel Player #1-F Lapper
New Frazer #1 Lapper
Bethel Player #73 Lapping Machine
Gisholt Clutch Balancing Machine
Gisholt Crank Shaft Balancing Machine
6 spd. National Acme Horiz. Automatic
Keller #3 Engraving Machine
Cincinnati 48x48x12' Planer, 2 hds. on rail
Bliss Model JC Wire Stitcher, MD ¼ HP V-belt drive, Like New
Acme 6 spindle tapping machine
Smalley General #1B Thread Milling Machine 22" x 8' bed
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P. & W. 6" Ver. Shaper
P. & W. 10" Ver. Shaper
GISHOLT Precision Balancer
ESPEN LUCAS #138 Cold Cutting Saw—Cap. of blade 12"
SLEEPER & HARTLEY Coil Winder
CINCINNATI Gear Burnisher

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MDNA protects the good will of the used machine tool industry by restricting membership to dealers qualified by business standing, character and reputation. The applicant must first be voted on by his local chapter, (or, if no local chapter exists, by the national board) and finally by the national board of directors. Thus, MDNA strives to maintain the MDNA membership trademark as a "seal of integrity".

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84" Niles-Bement-Pond, 28' long, 17' centers, 72" geared face plate DC drive
32"x35' Wickes Grd. Hd., M.D.
36"x30' LeBlond Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
32"x25' New Haven with raising blocks to 60"
30"x26' Lodge & Shipley 12 speed Geared Head, M.D.

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14" Pratt & Whitney Model "B" Vertical Surface Grinder, 25 hp motor-on-spindle
5 ft. Morris 13" column "Morspeed" Radial, motor-on-arm
#31 Lucas Horizontal Boring Mill, 3"
#2LMS 4-spindle Leland-Gifford Drill, motor on each spindle, new 1940
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Lees-Bradner 12"x36" Thread Miller (New 1941)
Pratt & Whitney 6"x80" Thread Miller
#5 Becker Vertical Miller
Bryant #10 Semi Automatic Grinder
42" Bullard Vertical Boring Mill
53" Niles-Bement-Pond Vertical Boring Mill
54" Bullard Vertical Boring Mill
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2—16" Bullard Mult Au Matics, eight spindle, in excellent condition, only one year old.
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CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

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10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x96	16x30	18x168

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72" x 56" x 16' Gray 4 heads. M.D.

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1—36"x36"x12' Cinci. Dbl. Housing Planer 2 rail hds., 1 side hd., D.C. m.d.

1—56"x56"x18" Cinci. Dbl. Housing Planer with 3 hds. D.C. vari. speed m.d.

1—6" Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.

1—12"x18" Cinci. Rebuilt Plunge Cut Grinder, 18"x9" face wheel, A.C. m.d.

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‡3H K & T Sliding Head Vertical Millers, M.D.
1—5' American triple purpose plain radial drill, motor on arm.
‡4 Cincinnati High Power Plain Miller, S.P.D.
‡4 Cincinnati Vertical Miller, H.P.S.D.
6' American Triple Purpose Plain Radial Drill, M.D.

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52" Bullard Vertical Boring & Turning Mill.
54" Colburn Vertical Boring & Turning Mill.
60" Gisholt Vertical Boring & Turning Mill.
60" Betts Vertical Boring & Turning Mill.
5' American Triple Purpose Pl. Rad. Drill.
6' American Triple Purpose Pl. Rad. Drill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
‡4 Cincinnati High Power Plain Miller, PRT.
‡4 Cincinnati High Power Vert. Miller, PRT.
‡1½ K & T Plain Milling Machine, Dble O.A. SPD

GRINDERS

12" x 96" Landis Plain, S.C.
16" x 72" Landis Plain Self contained.
18" x 85" Landis Plain Self contained.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
‡1 Adams Gear Hobbers.
‡1 Schuchart & Schutte Gear Hobber.

PLANERS

96"x96"x36' Cincinnati 4 Hds. M.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St., Cincinnati, Ohio

FOSDICK 3½' Radial Drill, G.B., M.D.
WOODWARD & POWELL 36"x30"x8' Metal Planer, 1 rail head, 1 side head.
POTTER & JOHNSTON 15" Shaper, M.D.
MARVEL No. 8 Metal Cutting Band Saw, cap. 18" x 18".
MILWAUKEE No. 2-B Double Over-Arm Plain Miller, Motor Drive.
Available Immediately. Also many other tools

ALEX ZEEVE & COMPANY
2269 Woolworth Bldg. New York 7, N. Y.

OTT MACHINERY SPECIALS

AUTOMATICS, Acme, 9/16" Mod. C & 2" Mod. B
AUTOMATICS, Gridley, 9/16, ⅞ & 1⅛" Mod. G.
AUTOMATICS, Cone, 1¼ & 1⅝" 4 spindle
AUTOMATICS, Gridley, ⅝, 1¼, 1⅝ & 2¼" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 4¼" S. S.
AUTOMATICS, Cleveland, 1¼, 1½, 2½, 3½ & 4½" M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland ⅞, 1¼ & 1½" Mod. M
AUTOMATICS, New Britain ‡22 & 24 Chuckers
AUTOMATICS, Potter & Johnston ‡5a & 6A
BORING MILLS, 24" Bullard, M.D.
BORING MILLS, Rockford, 3⅛" bar, Horizontal, 24x72" table, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, ‡7 High Speed, M.D. & ‡6.
GRINDER, Brown & Sharpe ‡2 Universal M.D.
GRINDER, Brown & Sharpe ‡5 Plain, M.D.
GRINDERS, Cincinnati 12" x 18" Plunge Cut
GRINDERS, Bryant ‡3 Internal, M.D.
GRINDERS, Rivett ‡103 Internal, M.D.
GRINDERS, Diamond Surface ‡2, M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14"x6' & 20"x8', M.D.
TURRET, Foster Universal, ‡2B, M.D.
MILLING MACHINES, ‡29 Ohio Universal, M.D.
MILLING MACHINES, ‡2B Rockford Universal, M.D.
MILLING MACHINES, Becker Vertical ‡5 & 6
MILLS, Briggs Production Type A&B
PLANER, Ohio 42" x 42" x 12' One Head, M.D.
PLANER, Gray 30" x 30" x 8', 2 Rail Heads

OTT MACHINERY SALES, INC.
542 Second Avenue
Detroit 26, Mich.

MDNA MEMBER

FOR SALE

AUTOMATICS: B. & S. No. 00, No. 1 Screw

AUTOMATIC: B. & S. No. 00 Cut-off

BORING MILL: Bullard 24" V.T.L. under power New Era

DRILL PRESS: Foote-Burt No. 25, No. 5 Taper, HD

DRILL PRESS: Barnes No. 262 sliding end 1941. 1 Sp. & 2 Sp.

GRINDER: Centerless Cinc. No. 2

GRINDER: Bryant No. 16—Int. Chucker (1943)

GRINDER: Excello Thread No. 31

GRINDER: Universal Cyl. Landis No. 1 cts.

GRINDER: Centerless #2 Zephyr (1944)

GRINDER: Landis Plain Cyl. Type C 6"x18" Hyd. 1942

GRINDER: Landis Brake Drum—23"x36"

LATHE: Hendey Yoke 12"x6' Taper Q.C.

LATHES (2): Adams Short-Cut Geared Head 14"x 4'

LATHE: New Challenger, G. Head 18"x24"x16' Q.C. (No Priority)

MILLER: Horiz. plus Vert. Att., Le Blond No. 3

MILLER: Horiz. Becker Bainard No. 26 (No. 1)

MILLER: Hand—Whitney No. 6

MILLER: Horizontal Cinc #2 MH 1941

PIPE: Cut-off—Hulbert-Rogers 3" cap.

PLANER: (2) W.P.—30"x30"x10' (1 hd) 2 hds)

PLANER: Sellers 72"x50"x28' 4 heads $2500

PUNCH & SHEAR: Kane & Roach #3-1" p. 8" Shear

RADIAL DRILL: 3'—9" column 12 Sp. Motor Arm 1941

RIVETER: Hanna, pneumatic 15"x30 ton

RIVETER: Grant, H. S. Spinning

RUN-IN MACHINES: for clutches

SHAPER: Cinc. 24" b.g.

SHEAR: Angle I beam—Pels T36

SAWS: Kalamazoo Band, new

TAPPERS: Haskins (1) No. 1C (1) No. 2C (1943)

TURRETS: (4): W. & S. No. 4 P to T & cross slide, cts.

TURRETS: W. & S. 2A geared Head

TURRETS: Gisholt—6¼" Spindle

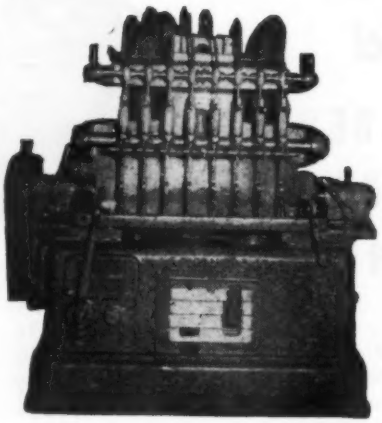
THREAD MILLER: Plan-O-Mill —Internal, External (1942)

WELDING MACHINES: Larkin 250 AMP Arc NEW

MONA MEMBER

KINGS COUNTY MACHINERY EXCHANGE
394 Atlantic Avenue. Brooklyn 2, N. Y.

SCHRANER Crankshaft LAPPER



Maximum Swing 8".

Maximum distance between centers 41".

Minimum distance between any two arms 4⅛".

Maximum distance between outer arms 41".

Arranged for motor drive in the base with motor.

This machine is now equipped with 8 arms. By increasing or decreasing the number of arms, many types of crankshafts, camshafts or straight shafts may be precision tapped.

Available for inspection at our Chicago warehouse

EMERMAN MACHINERY CORP.
875 West 120th Street — Chicago 43, Ill.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. — New York City

COMPLETE TOOL & DIE JOB SHOP

To be sold as going business. Located about 50 miles from Chicago. In a good industrial city in Indiana. Equipment consists of ten lathes, two turret lathes, eleven grinders, nine drills, five millers, four shapers, presses, boring bars, compressors, and misc. Complete detailed information on request.

IRON & STEEL PRODUCTS, INC.
13498 S. Brainard Ave. — Chicago, Illinois
"Anything containing IRON or STEEL"

FOR SALE

Newton Vertical Miller with 42" Rotary Table. New Condition. Never Used.

SHIELDS MFG. CO., INC.
38-09 24th ST., LONG ISLAND CITY 1, N. Y.
STILLWELL 4-0663

FOR SALE

Model HDLL 1836-9 Lithcarb Atmosphere Furnace 5' 6" wide 11' 7" long. Temperature Range 1200° F. Minimum to 1800° F. Max. Capacity for Neutral Hardening—135 lbs. per hr. complete with controls and instrument panel and blower—1 year old—actual use—6 mos.

Price $6550.00—F.O.B. Meadville, Pa. our Plant.

Model Pld. #2836 Lithdraw Furnace, Pit Type Normalizing furnace. 89" dia. x 65" high.—Heated area — 28" x 36" — Temp. Range 800° F. Min. to 1700° Max.

Complete with Controls, instrument panel and blower 1 year old—Actual use—6 mos. Price $8,000.00—F.O.B. Meadville, Pa. Our Plant. Condition—Like New.

Address replies to:

TALON, INC.
Box 445 — Meadville, Pa.

FOR SALE

Model HDLL 1836-9 Lithcarb Atmosphere Furnace 5' 6" wide 11' 7" long. Temperature Range 1200° F. Minimum to 1800° F. Max. Capacity for Neutral Hardening—135 lbs. per hr. complete with controls and instrument panel and blower—1 year old—actual use—6 mos.

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Complete with Controls, instrument panel and blower 1 year old—Actual use—6 mos. Price $8,000.00—F.O.B. Meadville, Pa. Our Plant. Condition—Like New.

Address replies to:

TALON, INC.
Box 445 — Meadville, Pa.

FOR SALE

2—26" Swing Model "C" Libby Turret Lathes complete with 3 jaw chucks and turret tools. These machines have hardened and ground ways and were bought new by us in 1935 and 1936. Both machines are in good condition, with fully enclosed fan cooled 220 volt motor and V-Belt Drive. Ready for immediate shipment and available for inspection on production work.

BROWNING MFG. COMPANY, Inc.
Maysville, Ky.

PIPE New & Reconditioned

ALL SIZES for ALL PURPOSES
Cut and Threaded to Your Specifications
VALVES AND FITTINGS
UNITED PIPE & SUPPLY CO., NORRISTOWN, PA.

FOR SALE

#4-C-8132 MARQUETTE PRESS

650 ton pressure, 20" stroke, 4 crank, air equipped, 89"x132" bed, 134" between the uprights.

ADELPHIA EQUIPMENT COMPANY
341 N. 3rd St. — Philadelphia 6, Pa.

THREAD CHASERS

Geometric, Modern, Namco, J & L, Rickert-Shafer, etc. HS and carbon. Standard and special threads.

FORT COMPANY
2238 N. Philip St., Phila. 33, Pa. REG 3631

New "SEARCHLIGHT" Advertisements received by 10 A. M. February 15th will appear in the March 1st issue, subject to space limitations.

Departmental Staff
AMERICAN MACHINIST
330 West 42nd St. — New York City

PRICED EXCEPTIONALLY LOW FOR IMMEDIATE DELIVERY

LATHES

48"x80"x24' Bed Fifield Lathe, D.B.G.
30" Houston, Stanwood & Gamble, Blocked to 64"x17'. M.D.
10 HP Motor with grinding attachment and other parts.
36"x14' Engine Lathe, B.G. Q.C. M.D.
27"x18' Leblond Lathe, Q.C.G. D.B.G. M.D. Geared Head.
30"x26' Lodge & Shipley Geared Head Lathe, M.D.
36"x30' Bridgeford Geared Head Lathe, Q.C. M.D.
30"x10' American Geared Head, M.D.
20"x22' Whitcomb Blaisdell Lathe, D.B.G. Q.C. M.D.
22"x16' Prentice Geared Head. Q.C.G. Single P.D. M.D.
24"x12' Putnam Lathe, Blocked to 28"x12'. D.B.G. M.D.
20"x10' Leblond Rapid Prod. Lathe. M.D.
16"x6' Cincinnati Lathe, D.B.G. Q.C.G. M.D.
21"x8' Leblond Prod. Lathe. D.B.G. Q.C. M.D.
17"x6' Leblond Prod. Lathe M.D.
16"x32"x8' Fay & Scott Gap Lathe
16"x8' Pratt & Whitney Lathe, M.D.
16"x6' National Lathe, Q.C.G. M.D.
13"x22"x5'x8' Barnes Gap Lathe. Standard Change
13"x5' Mulliner Lathe. Q.C. M.D.
14"x20" #9 Leblond Multi Cut Lathe. S.P. Geared Head.

MILLERS

#5 Cincinnati Hi-Power Universal. S.P.D.
#4 Cincinnati Universal. 3 step D.B.G. M.D.
#4 Cincinnati Hi-Power Plain. S.P.D.
#4 Cincinnati Plain, 3 step D.B.G. M.D.
#4B Brown & Sharpe Plain. Single P.D. M.D.
#4 Milwaukee Plain Standard Knee Type, Horiz. M.D.
#3 Cincinnati Plain Miller. D.B.G.
#3 K.T. Milwaukee Plain. M.D. 1939
#3½ Pratt & Whitney Duplex. Geared. P.F. to table. M.D.
#3 Van Norman. S.P. 1942 Model.
#3 Cincinnati Vertical. Single Pulley. High Power. Model C Becker Vertical. P.F. to rotary table. M.D.
#2 American Plain. P.F. in all directions. M.D.
#2 Leblond Plain. Back Geared. M.D.
Pratt & Whitney Automatic. P.F. to table.
#12 Brown & Sharpe Prod. M.D.
#7 Becker. Lincoln Type.
#2 Davenport Plain. M.D. 3 Slot. Table 9½"x36½"
#3½ Fox. Back Geared 6¾"x6½"
6"x132" Pratt & Whitney Thread Miller.
Lees Bradner Thread Miller. 12"x36" 1941 mod.
36"x36"x10' Ingersoll 4 hds. Planer Type. M.D. adjustable heads.
#6 Whitney Hand. Rack feed table.
#2 Brown & Sharpe Vertical. P.F. to table. M.D.
#08 Cincinnati Vertical. M.D. 1941
#A.B. Becker Vertical. S.P.
#OY Brown & Sharpe. P.F. to table
#2B Kearney & Trecker Horiz. S.P.
#3 Cincinnati Vertical Hi-Power. S.P.
#2 Brown & Sharpe Univ. Horiz.
Cochrane & By Vert. Univ.

SHAPERS

24" Gould & Eberhardt. B.G. M.D.
20" Steptoe, Gould & Eberhardt, Hendey. S.P. M.D.
18" Juengst, Springfield. M.D.
16" Flather, Smith & Mills. M.D.
7"x7" Rhodes, M.D. Vert. Slotting Attach.

AUTOMATICS

Gridleys, 3¼", 1¾", 1¼", ¾". M.D. Single and 4 Sp.
Cleveland, ⅞". 4 Sp.
New Britain, 1⅝". 6 Sp.
#23 New Britain Chuckers. 3½".
4 Spindle Cone Automatics. 2⅝", 3½".

BORING MILLS

Sellers Vertical, 100". M.D.
24" & 36" & 42" Bullard new Era types.
Bullard Vertical 42", 36", and 24". M.D.
Sellers Horiz. 6". M.D.
Universal Horiz. 4" M.D.
Lucas Horiz. 3". M.D.
Niles Horiz. 2¼". M.D.
Landis Horiz. 3". M.D.

GRINDERS

10"x48" Norton Surface. M.D. 1942 Model
14" Pratt & Whitney Vertical M.D.
Bridgeport Knife Grinder. M.D.
Springfield Vertical. S.P. M.D.
#70 Heald Internal. M.D.
9" Heald Rotary. Magnetic Chuck. M.D.
#11 Brown & Sharpe
#2 Brown & Sharpe Surface
#4 Gallmeyer & Livingston Universal Tool & Cutter. M.D.
Taylor & Fenn Internal. Cushman Chuck
K.O. Lee Tool & Cutter. Model A600. M.D. Many parts.
#46 Ex-Cello Carbide. Many parts. M.D.
#16 Abrasive. Internal. M.D.
10"x36" Landis self contained.

PLANERS

18' 3 hd. M.D.
24"x24"x5' Pond. 1 Head. Cone Driven
69"x41" Powell Open Side. Head on rail. 1 side head. M.D.
24"x24"x6' Gray. 1 Head on rail.
36"x36"x16' Gray. 4 hd. M.D.
30"x30" & 30"x30"10' and 12' Grays. 4 hd.
30"x30"x8' Niles 1 hd. on rail and 1 side head.
18' 3 hd. M.D. Gray.

PRESSES

#64¼ Power. 1200 ton. 22" stroke. 75 HP Motor
Watson-Stillman Hydraulic 1000 tons, 8" column
Farnham Hydraulic 250 tons. 4 Post. 4" Dia.
Crawford & Son Hydraulic 28" stroke, also 36" stroke
John Robertson & Co. Hydraulic 12" to 14" stroke
MANY OTHERS IN STOCK.

POWER SHEARS AND BRAKES

Robinson Power Press Brake. 8' 16 Gauge
Geo. A. Ohl Press Brake 8'. M.D.
Loy & Nawrath Power Squaring Shear. 10'. 3/16" ga.
#433 Bliss Squaring Shear. 6' x ¼" Cap.
Power Shear. 36" under drive. 14 ga. cap.
Adlerhurst Punch & Shear. 1"x6". 25" Throat
Geo. A. Ohl Foot Shear. 8'-18 ga.
#6 Buffalo Shear. M.D.
Pels Punch & Shear on wheels
8' Niagara Gap Type Shear 14 ga. #896
8' Stoll Power Shear. 14 ga.
#20 Pels

TURRET LATHES

18 Foster Universal. Geared Head. 2" Cap. M.D.
Bardons & Oliver, 4½" M.D.
1" Foster. M.D.
#2 Warner & Swasey. M.D.
Gisholt Tilting. 24" swing. M.D. 6".
Potter & Johnston Single Spindle for 3½" stock. Geared Head.
#1 Brown & Sharpe
Smur & Kamon 1¼". M.D.

RADIAL DRILLS

6' Cincinnati-Bickford. Single Pulley. 16" col.
4' Cincinnati-Bickford. Power feed all directions. 11" col. M.D.
4' Dreses. 4 step cone
3' Cincinnati-Bickford. Single Pulley. 9" col.
3' Niles. 10" col. Double back geared. M.D.
3' Bickford. Single pulley. #4 Morse Taper.

MISCELLANEOUS

William Laidlaw 30" Bandsaw M.D.
Oliver 30" Bandsaw. M.D.
3 Head Bliss Metal Forming Rolls. Heavy Duty
3 Head Rafter Metal Forming Rolls, Heavy Duty
5 Head Duplex Metal Forming Rolls, Heavy Duty
6"x6" Meyers Hacksaw
800# Chambersburg Steam or Air Hammer
#0 Baird Header Machine, Motorized
#2 Waterbury Header
Thread Roll Machine
Tinsmith Pipe Roller
Bolt Threading Machine. M.D.
5' and 6' Straight Edges
36" Corrugated Machine
#2 Mitts & Merrill Keyseater
Acme Bolt Cutter. M.D.
Robbins & Meyers Polishing Machine. M.D.

S & S MACHINERY CO.
207 CENTRE ST., NEW YORK 13, N. Y.
Telephone WOrth 4-5140

INVESTIGATE THESE REYNOLDS USED MACHINERY BARGAINS

1—ME-1 DeWalt Abrasive Cut-off Machine—M.D. new 1943
1—#401 Campbell Auto. Wet Abrasive Cut-off Machine, M.D. New condition
1—#6-R Acme Universal Turret Lathe—M.D.—slightly used
1—#1 Avey 4-spindle Drill—7½", M.D. Slightly used
3—#10 B & S Cylindrical Grinders
1—#100 Micro-Matic Honing Machine, new 1943
1—#2 MS Cincinnati Vertical Miller—dial type—new 1941
1—#3 B & S Vertical Miller, S.P.D.
6—#000 B & S Automatic Millers
3—#10 B & S Automatic Millers—new 1940
1—Kent-Owens Hand Miller—M.D., slightly used
6—#1-18 Cincinnati Automatic Millers
3—M-18 Kearney & Trecker "Simplex" Auto. Millers, new 1942
1—18" Cincinnati Manufacturing Miller—M.D., new '41 or '42
2—⅞" Cone Automatic Screw Machines—M.D.
1—1¼" Cone Automatic Screw Machines—M.D.
1—1½" Cone Automatic Screw Machines—M.D.
2—10"x48" Landis Type C Hydraulic Cylindrical Grinders, M.D., new 1941-1942

REYNOLDS MACHINERY COMPANY
211 Eddy Street Providence, R. I.
Tel. GAspee 5187

USED COLLETS
FEED FINGERS — PADS

ACME No. 515, No. 52, No. 53, No. 54, No. 55, No. 56.
ACME-GRIDLEY 1⅝".
Cleveland ⅞" to 2½".
Cone 1¼", 1½", 2½".
Foster No. 1, No. 2, No. 3, No. 4, No. 5, No. 7.
Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2¼", 2⅝", 3¼", 4¼".
Model "G" Gridley, ⅞".
No. 4 & No. 6 Warner & Swasey.
Bardons & Oliver, Brown & Sharpe, Davenport, Garvin, and New Britain.
Change Gears, Lead Cams, Form Cams, No. 53 to No. 56 Acme.
Form & Lead & Cut-off Cams for ⅞" G. Gridley.
Spindle gears, finger holders, collet tubes, push tubes, spindles, nose pieces for 2⅝" F. Gridley.
Large stock 1⅜" F. Gridley Collets.

SPECIAL
Master Collets and Master Feed Fingers for 4" Cone Automatics.

MDNA

GRAFF MACHINE TOOL COMPANY
7140 So. Halsted Street *Vincennes 9664* Chicago 21, Ill.

Grinder, 10' Bridgeport, Knife
Lathe, 20"x10' L & S. Grd. Hd.
Miller, Universal, #3 Cincinnati, M.D.
Miller Vertical, #3 B. & S., S.P.D.
Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut.
Straightener, Sheet 42" W-F, M.D.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

MDNA

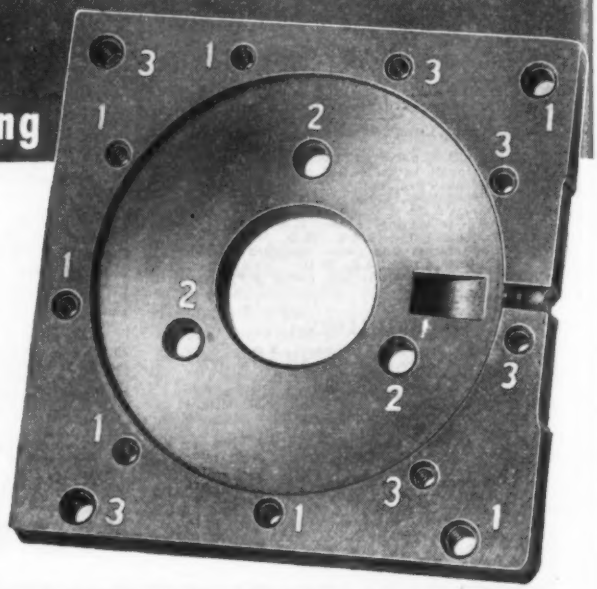
B. D. BROOKS, INC.
301 Atlantic Ave., Boston, Mass.

UNUSUAL VALUES

Brake, Robinson 5' toggle
Brake, Chicago steel, 3'
Drill, 3 spindle sensitive driven
Drill, 4 spindle high speed, Henry Wright
Drill, two-spindle sensitive, #1 Morse taper
Drill, Bickford 42" radial
Drill, 4-spindle sensitive
Grinder, LaSalle Surface
Hammer, 30# Bradley upright, helve
Lathe, J & L 2 x 24 turret motor drive
Lathe, 20" x 8' Bradford, motor driven
Lathe, Turret #2 Simmons practically new
Pipe Machine 8" Oster motor drive
Press, #1 OBI motor drive
Punch, ⅜ through ⅞" material
Punch & Shear two ½" capacity
Shaper 24" C & E
Threading Machine #0 Webster & Perks

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

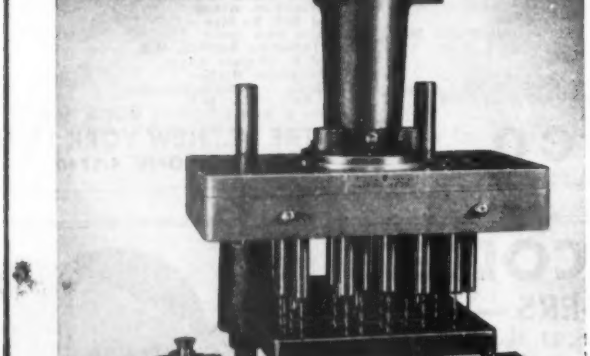
A good example OF HOW AND WHY THE *Ettco-Emrick* MULTIPLE HEAD SYSTEM assures fast production on small parts drilling and tapping



THE JOB—Shown actual size. Material, SAE 1010 steel, 1/4" thick. 16 holes to be drilled and tapped—9 for #6-40 pitch; 4 for #10-32 p.; 3 for #10-24 p. Note the closeness of center distances.

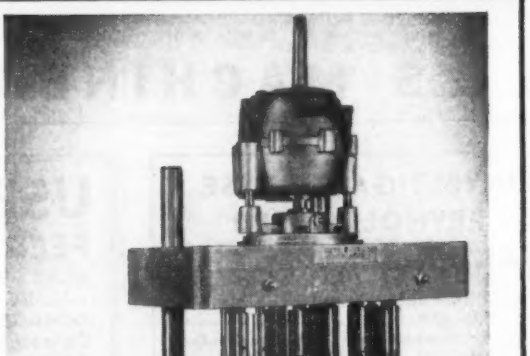
Illustrations below show fast production is obtained with the combination multiple drilling and tapping head and sliding carriage fixture—one of the many adaptations of the Ettco-Emrick System of multiple Heads which can be used on any drill press.

DRILLING



This is the combination equipment arranged for the drilling. Carriage is in loading position. Operator simply places part as shown. Accurate location and clamping is done automatically as carriage is moved to the first of the 3 drilling positions. Release is also automatic. Precise location at each position is assured by a locating rod at the back which engages a bushed hole in the carriage as the drilling head is lowered. Numbers on part above, indicate holes drilled at each position.

TAPPING



After the required quantity of parts has been drilled, the equipment is set up for tapping by simply removing the drilling face plate, bushing plate and drills, and mounting the tapping head driving unit and required adapter and tap units—a matter of minutes. Order of tapping holes at each station is the same as in drilling. With two separate heads, one for drilling and one for tapping, practically any required volume could be obtained.

BEFORE you decide on how to multiple drill or tap any small part, send a drawing or sample with essential data to Ettco-Emrick for recommendations. Engineers of many of the biggest firms in the country are doing this right along because they have learned it pays.

ETTCO TOOL CO.
590 Johnson Ave., Brooklyn 6, N. Y.
DETROIT 1 • CHICAGO 6

Over 25 years specialization in solving industry's drilling and tapping problems

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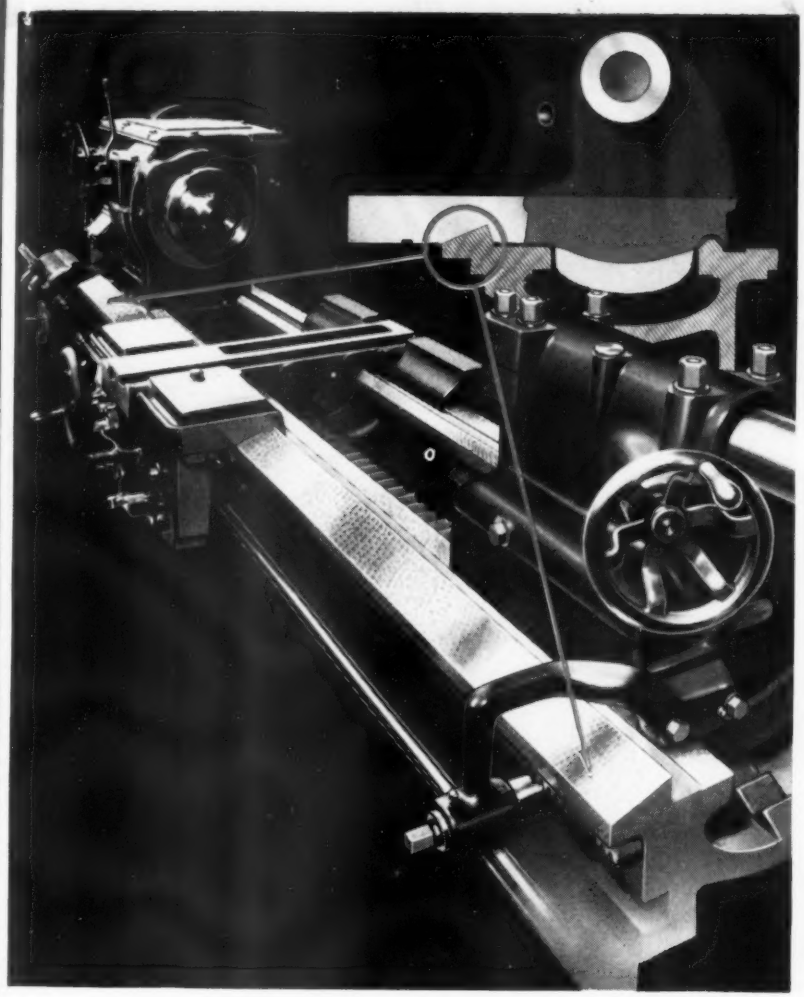

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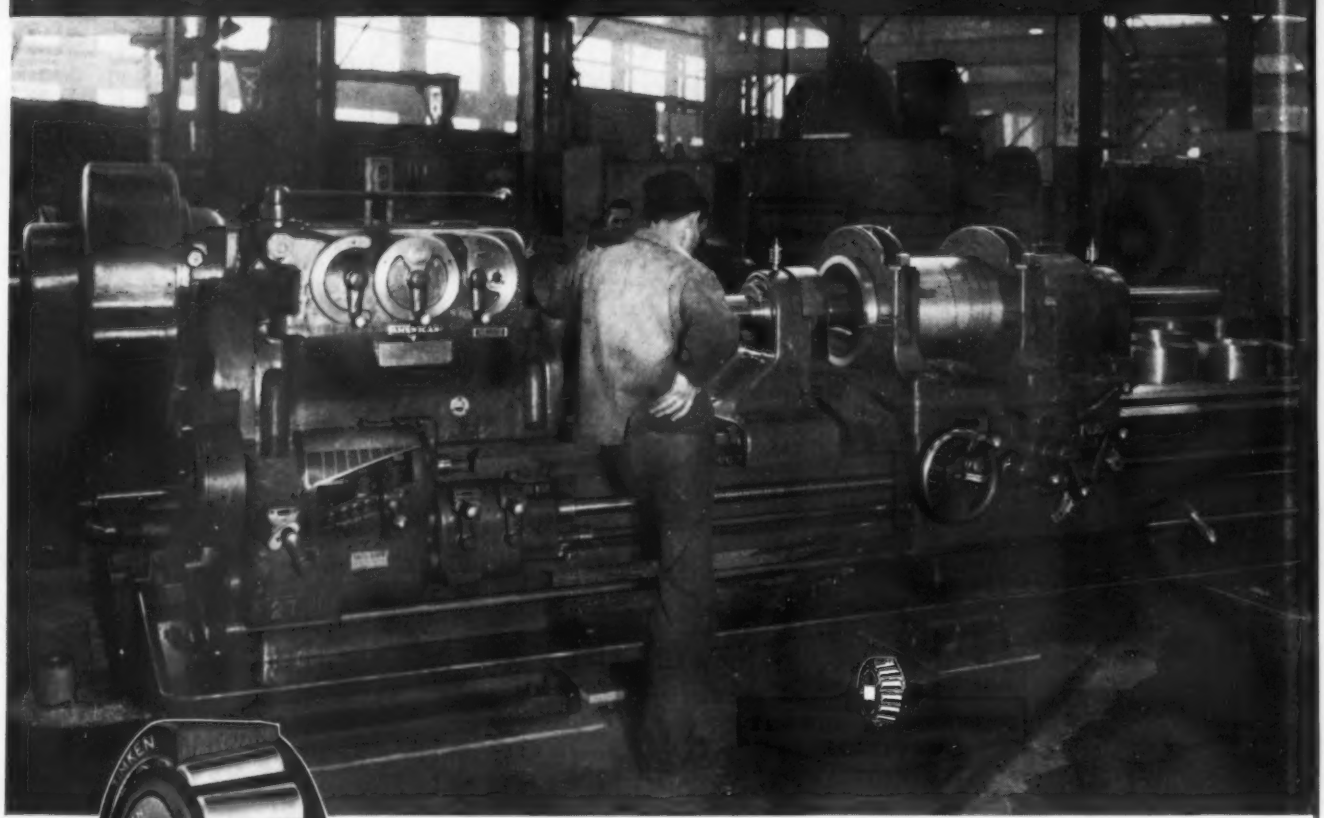

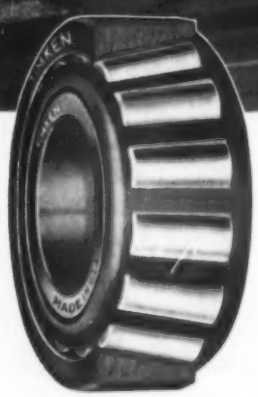

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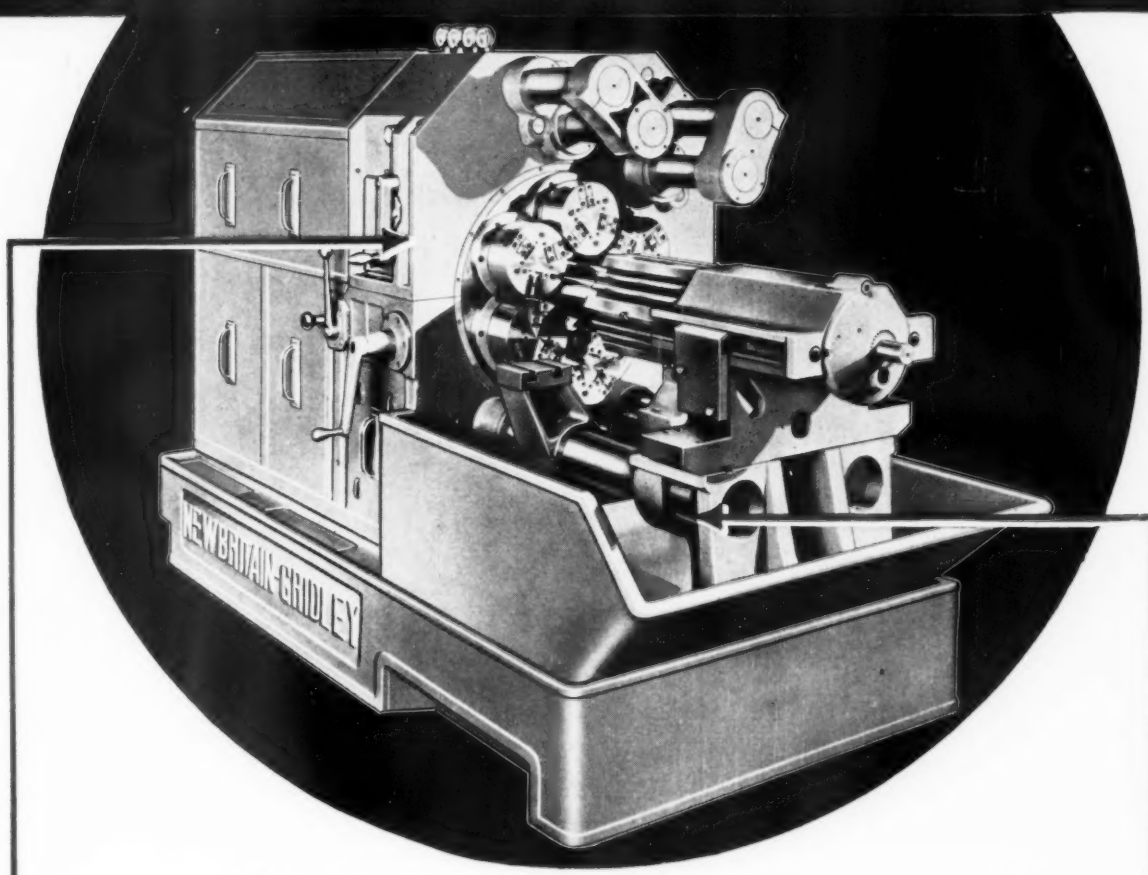
An OPEN AND SHUT *Case of More Production and Continued High Accuracy*



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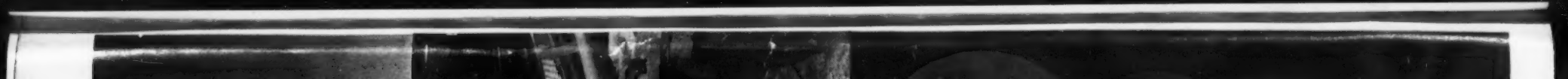
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